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Analysing technical efficiency and the profitability of banks in Vietnam

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Analysing technical efficiency and the profitability of banks in Vietnam

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ABSTRACT

This study examines the technical efficiency as well as determinants of bank profitability of 43 banks in Vietnam in the period of 2004-2013. First, bank technical efficiency is estimated under the stochastic frontier analysis (SFA) method applying translog input distance function where environment influence is accommodated by one-step procedure using maximum likelihood estimation. Second, three different groups of determinants, namely bank-specific (including technical efficiency), industry-specific and macroeconomic factors, affecting the Vietnamese banking system profitability will be examined by using system GMM. Overall, in terms of efficiency, the average technical efficiency level is around 73.8% and the period also witnessed a decreasing trend with the gap of efficiency between banks widening throughout the period. With respect to bank performance, empirical results provide evidence that the profitability of Vietnamese banks is shaped by bank-specific factors (including technical efficiency) and macroeconomic control variables. Industry structure does not seem to significantly affect profitability.

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LIST OF ABBREVIATIONS

SOCBs	State-owned commercial banks
JCBs	Joint stock commercial banks
JVBs	Joint venture banks (JVBs)
FBs	Foreign banks
SBV	State Bank of Vietnam
SOEs	State-owned enterprises
SMEs	Small and medium enterprises
VND	Vietnam Dong – Vietnamese currency
TE	Technical efficiency

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CHAPTER 1: INTRODUCTION

The Vietnamese banking sector is considered to have one of the highest growth rates in Asia in the next few years because of the country's continued economic expansion, the quick rise in household incomes, and relatively low penetration of existing banking services. Over the last two decades, the Vietnamese banking system has gone through substantial changes by being undertaken a series of reforms to strengthen and modernize the sector to move from a centrally-planned economy towards a more open and market oriented economy. The reforms started with the transformation from a mono-tier to a two-tier banking system, followed by banking restructuring programs for domestic banks, financial deregulation, a gradual opening to foreign banks and the partial privatization of state-owned commercial banks. These reforms have also been motivated by Vietnam's growing participation in international agreements, especially the country's entry to World Trade Organization (WTO) and ongoing efforts to adopt international standards such as the Basel capital framework or the International Financial Reporting Standards (IFRS). Currently, the Vietnamese banking system has become more important for the country than ever in history, total domestic assets in the system almost tripled between 2007 and 2012, growing from about VND 1,400 trillion to approximately VND 4,000 trillion. Further, more than two-thirds of domestic enterprises are being financed by the system and many major industries primarily rely on bank loans. Specifically, 90% of all Vietnamese seafood exporters are being 100% financed by banks or 70-90% of the total capitals of real estate enterprises are provided by banks (VACOD, 2012).

The banking sector undoubtedly greatly contributes to the development of the Vietnam's financial market as it promotes increasing inflows of fund for the country. The measurement of bank efficiency has gained increasing attention in recent financial crises when banks that are more efficient are less likely to fail (Wheelock and Wilson, 2000). Unfortunately, academia and authorities in Vietnam have not paid enough attention into studies of banking activities to improve bank performance as well as efficiency level. Until now, there have been several studies investigating the level of efficiency of banks in Vietnam (see Nguyen, 2007b; Vu and Turnell, 2010 and 2012; Ngo, 2010 and 2012; Nguyen et al., 2010; Nguyen and DeBorger, 2008;

and Nahm and Vu, 2013), but most of them focus on periods before the year 2006 and none of them go beyond 2010. Dinh's paper (2013) is considered the sole research studying the banks' profitability in Vietnam, but the author only focused on accounting ratios and completely ignored the economic efficiency level. As a result, a comprehensive picture of bank performance aspects is still in need for bank managers, supervisors and regulators in Vietnam to develop the country's banking system.

This paper investigates the level of technical efficiency as well as the effect of bank-specific (including technical efficiency), industry-specific and macroeconomic determinants on the profitability of the Vietnamese banking system over the period of 2004-2013 to provide a detailed view of how efficient the banking system is and what need to change to improve the performance of the sector. There are two major objectives to be completed in this research. First, bank efficiency is estimated under the stochastic frontier analysis (SFA) method applying translog input distance function in which environment influence is accommodated by one-step procedure. Second, together with the estimated technical efficiency, three different groups of determinants affecting the Vietnamese banking system profitability will be examined by using system GMM.

There are six chapters in this paper. Chapter 2 discusses the existing literature on both bank efficiency and bank profitability. Chapter 3 describes the Vietnamese banking industry structure and the Vietnam's economy in the last decade. Chapter 4 presents data collection and estimation methods for both technical efficiency and profitability's determinants. Chapter 5 shows empirical results and policy suggestions for bank managers and supervisors. Chapter 6 concludes the paper.

CHAPTER 2: LITERATURE REVIEW

2.1 Bank efficiency

The banking industry has received considerable attention from academics, practitioners, and regulators due to its important contribution to the stability of financial system and the efficient allocation of capital. As the stability of the banking system depends on the efficiency of banks, a substantial literature has investigated bank efficiency which is measured by a bank's ability to operate close to its empirical best-practice frontier (Schaeck et al. 2009). However, despite a considerable body of literature concerning about bank efficiency, there is no consensus on the source of the observed variation in efficiency. Berger and Mester (1997) argue that there are three reasons for this variation: (i) differences in efficiency concepts, (ii) dissimilarities in efficiency measurement techniques, and (iii) divergence in the potential correlates of efficiency. Generally, the three main efficiency concepts are technical, cost and profit efficiency. The last two types of efficiency are commonly termed economic efficiency taking into account price information and better correspond to traditional bank performance measures such as ROE or ROA. Nevertheless, technical efficiency (TE) has its own advantages, as it can be very informative in analysing how well a bank undertakes its operations. Kumbhakar and Lovell (2003) also state that the main disadvantage of economic efficiency compared to TE is that its measurement explicitly relies on bank objectives, but this dependence can be inappropriate under certain circumstances in actuality.

In the banking efficiency literature, there are two separate approaches which can be used to estimate efficiency, namely, non-parametric methods, such as data envelopment analysis (DEA) developed by Charnes et al. (1978), and parametric methods, such as the stochastic frontier analysis (SFA) developed by Aigner et al. (1977). The parametric methods involve defining the frontier via a functional form such as translog, which is estimated by several econometric techniques. On the other hand, the non-parametric methods do not presume any explicit functional form for the frontier and construct it from the observed input–output ratios using mathematical programming techniques. These two approaches differ in a number of ways. Firstly, non-parametric approaches do not need to specify of a distributional form for the inefficiency component or a functional form for the cost function, but they

do not incorporate statistical noise. On the contrary, parametric approaches confound the effects of any misspecification of functional form, but they can incorporate statistical noise and be used to conduct conventional test of hypotheses. Additionally, non-parametric methods may reveal substantial variations embedded in the data, while parametric methods can smooth the variation of productivity changes over time with a time trend if panel data are available. Moreover, parametric approaches require a large sample size so as to provide reliable estimations, whereas non-parametric approaches are relatively less demanding in terms of data (Coelli et al., 2005). It is noted that results obtained from parametric techniques are more useful than that of non-parametric techniques as they are based on economic optimization rather than technical optimization (Berger and Mester, 1997). Finally, due to the restrictive assumption about shocks to production and cost, stochastic frontiers based on a composed error model, which allow researchers to distinguish between inefficiency and other stochastic shocks, are considered superior to non-parametric frontiers in measuring efficiency.

There has been a wide range of studies about the inefficiency in banking institutions all over the world. For efficiency studies specific to European banks, Maudos et al. (2002) found an average cost efficiency level of 83% with a 5% truncation level. Staikouras et al. (2008) reported cost inefficiency ranging from 33% to 47% for various countries in South Eastern Europe from 1998 to 2003, whereas Koutsomanoli-Filippaki et al. (2009) found cost inefficiencies in 11 central and Eastern European countries varying from 8.4% for Poland to 38.8% for Lithuania. Yildirim and Philippatos (2007) reported cost efficiency of 77% for transition economy European banks over the period 1993-2000. For efficiency studies to Islamic banks, Hassan (2005) used SFA to obtain an estimate of 74% cost efficiency and 84% profit efficiency for Islamic banks in 21 countries from 1993 to 2001. By using a translog output distance function, Abdul-Majid et al. (2008) reported that potential output was 8.2% and 21.5% higher than the actual output for conventional banks and Islamic banks respectively when estimating efficiency of banks in 10 countries over the period 1996-2002. They also found that conventional and Islamic banks operated around 3% and 5% below optimal size. In Asian banking systems, Hao et al. (2001) found that faster growing banks making intensive use of core deposits in funding assets are more cost efficient. Kwan (2006) reported an

increasing cost efficiency of commercial banks in Hong Kong. Lim and Randhawa (2005) compared efficiency level of Singapore and Hong Kong banks and found that Singapore banks are more efficient in mobilizing resources for financial services, while Hong Kong banks are more efficient in utilizing funds and financial intermediation.

The efficiency level of banking system in Vietnam has obtained attraction in recent years. Nguyen's study (2007b), which is considered the first paper on Vietnamese banking efficiency, reported that the average cost efficiency of 13 commercial banks from 2001 to 2003 is about 60.6% by using DEA. He also showed that total factor productivity increased by 5.7% in 2003 compared to 2001. It should be noted that many researchers found a decreasing trend in the efficiency of Vietnamese bank. Using SFA, Vu and Turnell (2010) found that the level of cost efficiency of 56 commercial banks in Vietnam from 2000 to 2006 is around 87%, but there was a reduction in cost efficiency in the studied period. Similarly, Ngo (2012) found a decreasing trend in technical efficiency for the whole Vietnamese banking system through the period of 1990-2010 as the size of the banking sector increases and financial market is more liberate. He also reveals that the Vietnamese banking system is running at two-third of its capacity, which has limited contribution to the economy. Nguyen and DeBorger (2008) also found a decreasing trend in efficiency when studying 15 commercial banks in Vietnam from 2003 to 2006 due to the rapid extension of the Vietnamese banking industry, especially in terms of network expansion and branching.

Besides that, there are several notable findings about banking efficiency in Vietnam that should be considered. For example, Nguyen et al. (2010) estimates and compares efficiency performance of 32 commercial banks in Vietnam during 2001–2005. They found that there were a small number of efficient banks, and there would be room for these banks to improve their production efficiency. Further, larger banks do not guarantee higher efficiency scores compared to small banks. They also reported that bank size, state ownership and market share have effects on Vietnamese bank efficiency. Ngo (2010) reported an imbalance of the banking system in Vietnam when more than one-third of the studied sample of 22 commercial banks has the advantage of increasing returns to scale, the other one-third face

decreasing returns to scale when studying 22 Vietnamese commercial banks in the year of 2008. Vu and Turnell (2012) using the translog hyperbolic distance function for the sample of commercial banks from 2000 to 2006 found a modest growth of 1.78% per year in the productivity change due to the growth of technological progress and the improvements of technical efficiency. Moreover, FBs experienced the highest productivity growth because of modern technology infrastructure, followed by JCBs and SOCBs. Recently, Nahm and Vu (2013) using the sample of 56 commercial banks from 2000 to 2006 pointed out that the average bank operates quite far below the frontier of the best-practice bank, mainly due to allocative inefficiency rather than technical efficiency. Moreover, they also showed that the price efficiency scores of SOCBs were much higher than those of JCBs and FBs, suggesting the existence of market power for SOCBs in pricing bank products in Vietnam. They further found that SOCBs were more profit efficient than FBs and JCBs as they are being guaranteed and supported by the government and having nationwide branch networks as well as a huge customer base.

Table 1: Summary of studies on banks' efficiency in Vietnam

Study	Sample size	Studied period	Inputs (X) and outputs (Y)	Findings
Nguyen (2007)	13 commercial banks	2001 – 2003	X1: labour X2: capital X3: deposit Y1: interest income Y2: non-interest income	The cost efficiency increased by 5.7% in 2003 compared to 2001. The average cost efficiency is about 60.6%.
Vu and Turnell (2010)	56 commercial banks	2000 – 2006	X1: personal expenses/number of employees X2: other non-interest expense/fixed assets X3: interest expense/total borrowed funds Y1: customer loans Y2: other earning assets Y3: off balance sheet items	The average cost efficiency is about 87%, but there was a decrease in cost efficiency over the studied period.
Ngo (2012)	Whole Vietnamese banking system	1990 – 2010	X1: value of total deposits Y1: value of credits Y2: value of GDP Y3: value of money supply	A decreasing trend in efficiency as the size of the banking sector increases; financial market is more liberate and there is slowdown in the economy.
Nguyen and DeBorger (2008)	15 commercial banks	2003 – 2006	X1: labour X2: deposit X3: operating expenses X4: fixed assets Y1: loans and advances Y2: investments	A decreasing trend in technical efficiency due to the rapid extension of the Vietnamese banking industry, especially in terms of network expansion and branching

Nguyen, Giang, and Nguyen (2010)	32 commercial banks	2001 – 2005	X1: personal expenses X2: net total assets X3: deposit X4: labour Y1: received interest Y2: other operating income Y3: loans	There were a small number of efficient banks, but there would be room for these banks to improve their production efficiency. Bank size, state ownership and market share have effects on bank efficiency
Ngo (2010)	22 commercial banks	2008	X1: wages X2: interest and similar expenses X3: other expenses Y1: total assets Y2: interest and similar income Y3: other incomes	An imbalance of the Vietnamese banking system: more than one-third of the sample banks having the advantage of increasing returns to scale and the other one-third having decreasing returns to scale.
Vu and Turnell (2012)	56 commercial banks	2000 – 2006	X1: number of full-time employees X2: fixed assets X3: deposit Y1: loans Y2: other earning assets Y3: off balance sheet items	A modest growth of 1.78% per year in the productivity change due to the growth of technological progress and the improvements of technical efficiency. Moreover, foreign banks are found to have the highest productivity growth.
Nahm and Vu (2013)	56 commercial banks	2000 – 2006	X1: number of full-time employees X2: fixed assets X3: deposit X4: equity capital Y1: loans Y2: other earning assets Y3: off balance sheet items	On average, Vietnamese banks operate quite far below the frontier of the best-practice bank mainly due to allocative inefficiency rather than technical efficiency. There exist SOCBs' market power in pricing bank products and SOCBs were more profit efficient than FBs and JCBs due to supports from government, nationwide branch networks and huge customer base.

2.2 Bank profitability

In the literature, internal and external determinants are considered the two main components expressing bank profitability. The internal determinants are often termed bank-specific determinants of profitability. The external determinants can be decomposed into industry-specific and macroeconomic factors. It is noted that the macroeconomic determinants are not related to bank management but reflect the economic and legal environment that can affect the operation and performance of banks. Most researchers have measured profitability using return on equity (ROE) or return on assets (ROA). They focus on profitability analysis of either cross-country or individual countries' banking systems.

One of the first that examines the determinants of banks profitability is the study of Molyneux and Thornton (1992) who found a positive association between the return on equity and the level of interest rates, bank concentration and the government ownership when studying bank profitability across 18 European countries over the period 1986-1989. Demirguc-Kunt and Huizinga (1999) examined the internal and external determinants of profitability for banks in 80 countries over the period 1988-1995 and found that a larger bank asset to GDP ratio and a lower market concentration ratio lead to lower profits. They also revealed that foreign banks have higher profits compared to domestic banks in developing countries, while the opposite holds in developed countries. In a more recent study, Abreu and Mendes (2001) examined Portugal, Spain, France and Germany and pointed out that equity to assets and loan to assets ratios have a positive effect on banks' profitability. They also show that bank's market share have a positive impact profits measures but not on net interest margins, whereas the opposite holds for operating costs. Goddard et al. (2004) investigated the determinants of profitability in Denmark, France, Germany, Italy, Spain and the UK from 1992 to 1998. They found weak evidence for any size–profitability relationship and a positive relationship between capital-assets ratio and profitability. UK is the only place where a positive relationship between the importance of off-balance-sheet business in a bank's portfolio and profitability is found, this relationship is neutral or negative elsewhere (Pasiouras and Kosmidou, 2007).

In the latter studies, researchers use various bank-specific ratios such as total expenses to net income, equity to total assets, loan loss reserves to gross loan or loans to deposits. For macroeconomic variables, money supply growth, inflation, unemployment rate and real interest rates are often be used and for industry variables, concentration or ownership structure can be used. More recent accounting-based studies tend to adopt panel techniques, instead of simple ordinary least squares (OLS), to analyse bank profitability. Studies in this approach include Kwan's (2003) comparison of the performance of banks in seven Asian countries from 1992 to 1999, Kosmidou et al.'s (2007) examination of the profitability of Greek banks operating abroad during 1995-2001., and Ben Naceur and Goaied's (2008) study of the profitability of 14 Tunisian banks over the period 1980-2000. Athanasoglou et al.'s study (2008) is one of the most comprehensive analyses of bank-specific, industry-specific, and macroeconomic determinants of profit persistence in Greek banks over the period 1985-2001 by using GMM. They found that profitability of Greek banks is shaped by bank-specific factors such as capital, labour productivity and operating expenses and macroeconomic control variables such as inflation and cyclical output. Generally, empirical studies show that various measures of cost have negative relationship with profits. Larger bank size, higher market share, higher market concentration, greater GDP growth, lower unemployment rate, and higher proportions of equity capital assets often imply greater profitability. Higher liquidity, greater loan losses provisions, and more reliance on debt are associated with lower bank profits, but opposite results are also abundant.

Until now, Dinh's paper (2013) is considered the only study investigating the determinants of banks' profitability in Vietnam with the sample of 51 commercial banks from 2000 to 2012. He pointed out that profitability's determinants of foreign banks and domestic banks in Vietnam are different. Market share and other incomes are found to be positively correlated to profitability of foreign banks in Vietnam, while cost, equity and GDP growth rate are important in explaining profitability of domestic banks. Further, he also investigated the determinants of accounting efficiency proxied by net interest margin of banks in Vietnam. For foreign banks, cost and market share are found to have positive effects on net interest margin, whereas

equity, loans and loan loss provisions are important in explaining net interest margin of domestic banks.

Although the empirical results vary significantly due to differences in both datasets and environments, there are some common literature and arguments behind control variables that researchers need to understand when studying bank profitability:

Size. Size is introduced to account for existing economies or diseconomies of scale in the market. Short (1979) argues that size is closely related to the capital adequacy of a bank since large banks can often raise less expensive capital, hence more profitable. Smirlock (1985) reported a positive and significant relationship between size and bank profitability. However, many other researchers suggest that little cost saving can be achieved by increasing the size of a banking firm (Berger et al., 1987). Besides that, Demirguc-Kunt and Huizinga (2000) also suggest that the extent to which various financial and legal factors affect bank profitability is closely related to bank size.

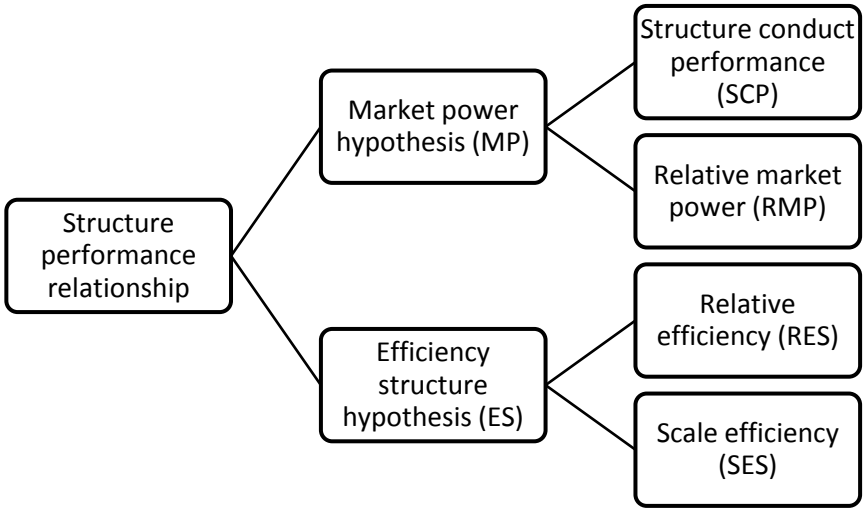
Risk management. Without the doubt, the need for risk management is vital in the nature of the banking business. Poor asset quality and low levels of liquidity are the two major causes of bank failures. Financial institutions tend to diversify their portfolios and raise liquid holdings so as to reduce risk. Risk can be divided into credit and liquidity risk. The relationship between risk and return is mixed. High-risk loans negatively affect bank profitability due to high accumulation of unpaid loans, but the risk-return hypothesis suggests a positive relationship between risk and profits due to high rate charged. Molyneux and Thornton (1992) found a negative and significant relationship between the level of liquidity and profitability while Bourke (1989) reported an opposite result.

Bank expenses. Expenses are also a very important determinant of profitability as they are closely related to the efficient management. There is an extensive literature based on the idea that an expenses-related variable should be added in a profit function. Their relationship is also mixed. Higher costs traditionally imply lower profit, but it can also infer higher volume of activities and thus higher profit.

Market power and efficient structure hypotheses. The application of the market-power (MP) and the efficient-structure (ES) hypotheses is a new trend about

structural effects on bank profitability (see figure 1). The MP hypothesis consists of the structure-conduct-performance (SCP) hypothesis and the relative-market-power (RMP) hypothesis. The former states that high concentration leads to market power because of collusion, which yields monopoly profits through pricing behaviour. The latter suggests that only firms with large market shares and well-differentiated products are able to exercise market power and earn non-competitive profits. The ES hypothesis suggests that increased managerial (RES) and scale (SES) efficiency can lead to higher concentration and hence higher profits. Thus, the finding of a positive relationship between concentration and profits may be a spurious result due to correlations with efficiency. To solve this issue, Berger (1995) argues that to verify the existence of MP hypothesis, researchers also need to show that efficiency does not have effects on concentration and market power; and to verify the existence of ES hypothesis, one needs to show that efficiency affects concentration and market share. However, Bourke (1989) and Molyneux and Thornton (1992) argue instead that the increase in concentration is not the result of managerial efficiency, but rather reflects increasing deviations from competitive market structures leading to monopolistic profits. Consequently, concentration should be directly related to bank profitability without considering the effects of efficiency.

Figure 1: Structure performance relationship



Source: Berger (1995)

Macroeconomic factors. As banks are affected by macroeconomic conditions, macroeconomic variables also play an important role in explaining bank profitability. The variables normally used are the inflation rate, GDP growth rate, unemployment rate, the long-term interest rate, or the growth rate of money supply. For many studies, inflation and the level of interest rates are correlated with bank performance, and the unemployment rate has a significant negative impact on profitability while the effective exchange rate is irrelevant in explaining profitability (Athanasoglou et al., 2008).

Overall, Athanasoglou et al. (2005) summarised that the existing literature provides a rather comprehensive picture of the effect of bank-specific and industry-specific determinants on bank profitability. Nevertheless, the effect of the macroeconomic environment is not adequately dealt with as the time dimension of the panels used in empirical studies is usually not large enough to capture the effect of the macroeconomic environment.

CHAPTER 3: COUNTRY ANALYSIS

3.1 Overview of banking system

In order to understand the Vietnamese banking structure, it is necessary for readers to understand its historical development as this explains how the current structure of the system shaped up.

3.1.1 Historical development

Before 1975

The history of the Vietnamese banking system begins in the late 18th century and the system has experienced considerable changes along the side of the country's history. Before 1954, it was purposely designed to serve the French colonization. In 1870, Hong Kong and Shanghai Banking Corporation (HSBC) established the first branch in Saigon to finance trading activities. In 1875, the French colonists established the Bank of Indochina, which acted as a central bank of Vietnam, Laos and Cambodia. In 1904, Standard Chartered Bank set up its branch in Saigon. Bank of East Asia and Banque Française Commerciale also went to Vietnam in 1921 and 1922 respectively. In 1927, the first domestic bank, namely Bank of Vietnam, was established by a group of Vietnamese intellectuals and dignitaries.

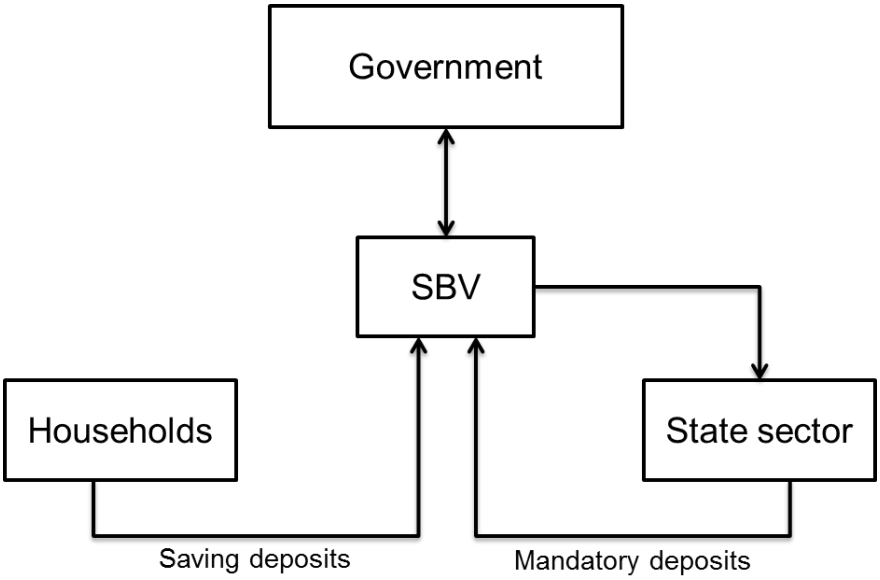
Between 1954 and 1975, Vietnam had two fundamentally different banking systems because of the North-South division due to the Geneva Act in 1954. The system in the South belonging to the Republic of Vietnam was a market-oriented two-tier system. In 1972, the banking system in the south consisted of 14 foreign branch banks, 17 private commercial banks, 1 state-owned commercial bank and 1 joint-stock bank with the total of 174 branches for the whole system (Doan, 2001). The system in the North belonging to the Democratic Republic of Vietnam was patterned on the Soviet model, known as monobank, in which the National Bank of Vietnam[1] (NBV) was the only bank. NBV was responsible for supplying credit, receiving deposits from state-owned enterprises (SOEs), implementing and enforcing the central plans of the North government. In 1960, NBV was renamed the State Bank of Vietnam (SBV) which is also the central bank of Vietnam until now.

[1] The NBV was established on 6 May 1951 under the Order 15/SL signed by president Ho Chi Minh

1975 – 1986

After the reunification in 1976, the banking system in the South was promptly nationalized and taken over by the SBV. Following the government's Ordinance No. 163/CP in regulating the organization and function of the SBV, a one-tier banking system following the Soviet model was established in which the SBV was the sole issuing bank of Viet acting as both the central bank and a global commercial bank. SBV was responsible for issuing banknotes; taking saving deposits from households and mandatory deposits from state sector; financing the state budget; supervising state funds; serving state sector; and managing monetary, credit, and payment operations. In short, the Vietnamese banking system in this period was a typical case of a centrally planned economy and completely accommodative to state owned enterprises. The mono-tier Vietnamese banking system in the period 1975-1986 is shown in the figure 2

Figure 2: Vietnamese mono banking system between 1975 and 1986



Source: Tran (2001, p.7)

The central planning banking system was too weak and mismanaged the economy due to top-down unrealistic orders. This led to the hyper-inflation of 774% in 1986 (Abuza, 2002, p.4), huge budget deficit, depressed production, dire poverty and the collapse of people's credit union (Dinh, 1997). Besides that, the threat of aid withdrawal from Soviet Union, the friction with China and the embargo imposed by the United States also aggravated the situation. As a result, the Vietnamese

government decided to implement an economic revolution in the end of 1986 with the aim of reforming and transforming the economy from closed command based on central planning to market-oriented type (Siregar, 1999). Due to its importance, the banking system was selected as one of the first sectors to be reformed to combat the multifaceted economic crisis.

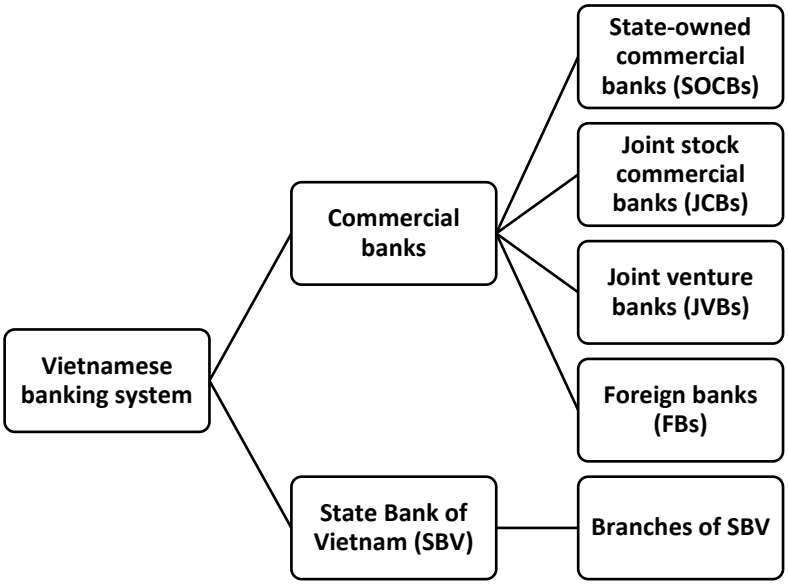
Banking reformation

The banking reformation in Vietnam started in 1988 with the aim of expanding and diversifying the banking system, rationalizing interest rates, and improving credit allocation, legislation, and supervision. The ultimate objective is to create a sound banking system capable of mobilizing and allocating financial resources to the best uses in order to improve the economic growth. The reform consisted of decentralization, liberalisation, legislation and supervision, recapitalization and privatization (Le, 2006).

To decentralize the banking system, the Vietnamese government detached state management in money, credit and banking from commercial banking following the Decision No. 53/HDBT in 1988. Since then, the SBV has acted as the central bank of Vietnam and been responsible for conducting national monetary policy and supervising commercial banks. This transformed the monobank system into a two-tier banking system in which the SBV handed over all commercial banking functions to commercial banks and began act as a true central bank (see Figure 3). In 1988, the SBV's commercial banking functions were also commercialized and passed over to four newly established state-owned commercial banks consisting of Vietnam Bank for Agriculture and Rural Development (often called Agribank), Vietnam Joint-Stock Commercial Bank for Industry and Trade (often called Viettinbank), Bank for Investment and Development of Vietnam (often called BIDV) and Joint Stock Commercial Bank for Foreign Trade of Vietnam (often called Vietcombank). The four banks were sector-specialized in the beginning: Agribank primarily offered credit services to the agricultural sector and rural areas, Viettinbank was a financier of industrial development projects, BIDV served as a development bank that financed infrastructure and investment projects and Vietcombank was responsible for financing foreign trade transactions and managing foreign currency reserves. Currently, they offer a wide range of financial services and no longer specialize in

their former focuses. It should be noted that these four banks are always considered the biggest banks in the Vietnamese banking system.

Figure 3: Structure of the two-tier banking system in Vietnam (after May 1990)



Source: Ngo (2012, p.5)

After decentralization, the Vietnamese banking system was liberalized to reduce the domination of the SOCBs in 1989 as this caused irrational allocation of the country's financial resources. For example, 90% of bank credits were distributed to SOEs in 1991 (Le, 2006). Liberalisation allowed the entry of new banks, thus promoted competition and increased allocative efficiency. The restructuring process continued with the announcement of two Decrees in 1990: one on the State Bank of Vietnam and the other on Banks, Credit and Cooperative and Financial Companies. This marked a new step towards the market oriented system. Since then, many JCBs, JVBs and FBs were established and started to open their representative offices in Vietnam. In fact, the number of JCBs, JVBs, and FBs significantly increased from 0 in 1990 to 52 in 1995 (see the table 14 in the appendix).

After liberalisation, the importance of prudent banking legislation and supervision attracted the attention of government to reduce the risk of systematic crises, especially in the early stage of the economic revolution. Thus, many regulations in managing the banking sector were imposed. For example, for loan security, the Decision No. 217/QD-NH1 in 1996 allowed borrowers to pledge land-use right certificates as collateral for bank loans. The rules on credit exposure prohibited credit

institutions to lend to a single client more than 15% of their equity except for loans authorized by the government. In 2005, Basel Accord on capital adequacy which requires banks to have their equity equal to at least 8% of risk-adjusted assets was adopted for the Vietnamese banking system. The rules for deposit insurance were also imposed in 1999 following the Decree No. 89/1999/ND-CP that commercial banks must purchase deposit insurances from the Deposit Insurance Corporation of Vietnam.

Recapitalization was implemented next to provide banks sufficient capital to absorb market shocks and grow. In 1998, VND2.4 trillion was allocated from the SBV into SOCBs. In 2001, another state fund was spent for the recapitalization, conditional on the fulfilment of bank-specific operational and financial reform targets set up by the government (IMF, 1999). In 2003, VND1,900 billion from the national budget was allocated by the ministry of finance to SOCBs. In 2004, the SBV injected VND38,102 billion into the SOCBs through open markets (Saigon Economic Times, 2004).

The final move in the banking reform is the pending privatization for SOCBs. Until now, Viettinbank and Vietcombank among other SOCBs are privatized the most with 35.54% and 22.9% in 2013 respectively (Viettinbank annual report, 2013 and Vietcombank annual report, 2013). Currently, the government plans to equitize more SOCBs either through formal auctions or as IPOs; and BIDV is the third SOCB under the privatization plan (BIDV annual report, 2013). Agribank is expected to be the last SOCB for the privatization plan.

3.1.2 Current structure of the Vietnamese banking system

According to the figure 3, there are SOCBs, JCBs, FBs and JVBs under the Vietnamese commercial banking system. Their main characteristics and operations are as follows:

- *SOCBs*. They are 100% owned by the government (Agribank and BIDV) or partially equitized but the state is still the largest shareholder (Viettinbank, Vietcombank, and MHB). Most of them have advantages of large capital size, reflecting in VND 64,037 billion of chartered capital in 2010. State-owned enterprises (SOEs) which often have higher exposure to non-performing loans compared to other enterprises are their traditional customers. Specifically, 60% of

2010's non-performing loans were from SOEs. During the period 2005-2010, SOCB's market share has dramatically reduced, though still remains higher than those of JCBs, JVBs and FBs. The total loans of the sector made by four largest SOCBs, namely BIDV, Agribank, Vietcombank and Viettinbank reduced from 74.2% in 2005 to 48.3% in 2010. SOCBs' deposits market share also declined from 74.2% in 2005 to 47.7% in 2010.

- *JCBs*. They operate more actively and have gradually grabbed market share from SOCBs over time. They also have diversified shareholder composition and focus on retail banking and lending to small and medium enterprises (SMEs). Their market share went up significantly in recent years, reaching 37.1% for credit in 2010. Nevertheless, the capital size of the group is still small compared to that of SOCBs. Largest JCBs, namely Eximbank, ACB, Techcomback, and Sacombank, have chartered capital ranging from about VND 9,000 billion to about VND 10,000 billion. Middle-sized JCBs that have chartered capital of about VND 5,000 billion include Military Bank, Maritime Bank and South East Asia Bank. Most of other JCBs have chartered capital of around VND 2,000-3,000 billion.

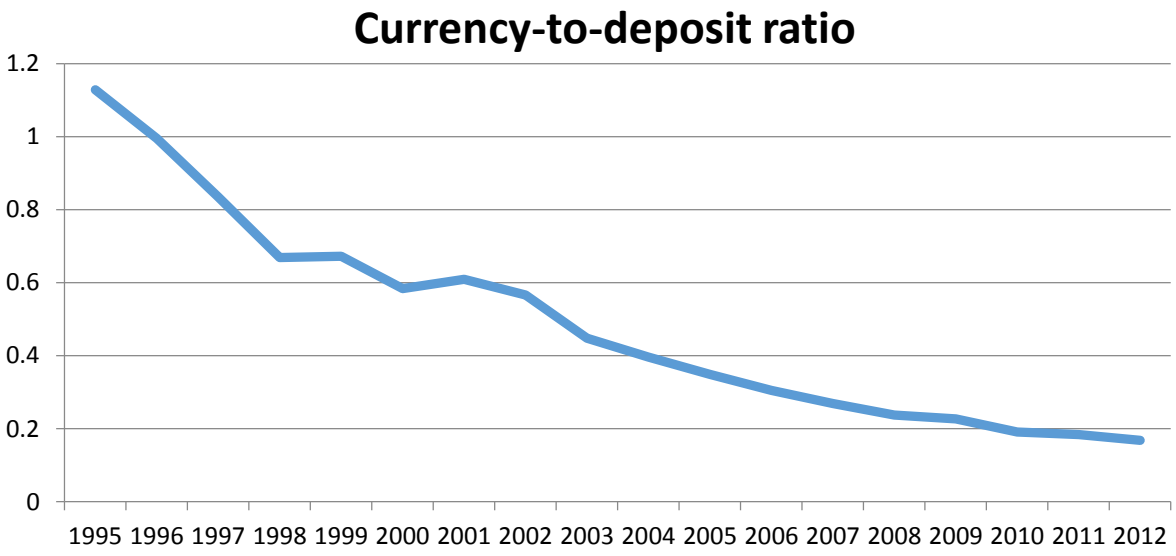
- *JVBs and FBs*. They have strengthened their penetration into the Vietnamese banking market recently. Retail banking, high quality service and the ability to provide sophisticated products are their main advantages. Currently, retail banking has not been effectively exploited by domestic banks. Large FBs such as HSBC, Citibank, ANZ, Standard Chartered and Deutsche Bank have taken major steps in expanding their operating network in Vietnam. Citibank and Standard Chartered officially launched its retail banking in Hanoi in 2010. HSBC also opened more new branches in Danang City and Cantho City in 2013. In addition, some FBs have been holding stakes in domestic JCBs. For example, Standard Chartered had the holdings of about 12% in ACB in 2011; HSBC owned 20% of Techcombank in 2013, ANZ held 10% of the total shares of Sacombank in 2010; and Deutsche bank had the holdings of 10% in Habubank in 2010. Market share of this group has not witnessed any major changes due to their mobilization which is capped in relation to capital funded from mother banks. Deposits and credit market share of these banks are about 9% and 14% respectively recent years. Even though the limits on fund mobilization have been lifted since 2011, it

would be difficult for the group to improve their market share immediately as their operating networks are relatively smaller than that of domestic banks.

Although the Vietnamese banking reformation has to some extent contributed to the development of its banking system and economic growth, the system remains fragile, undercapitalized, largely exposed to state ownership and intervention, improperly managed, regulated and supervised as the reforms were not properly sequenced (Le, 2006). He explains that the recapitalization process was not implemented in the right time when non-performing loans (NPL) were not resolved as a large part of the NPLs are not secured with collateral and prudent regulations were dilatorily imposed (e.g. the delay in adopting the Basel I on capital adequacy till 2005). This led to a quick rise in the establishment and then collapse of a number of undercapitalized but over-leveraged credit cooperatives, which dampened public confidence. Le (2006) also argues that recapitalization should not have been repeated as recurrent recapitalizations created soft budget constraints in which SOCBs continue to finance inefficient SOEs as they believe the state will continue to provide funds through recurrent recapitalizations. Berglof and Roland (1997) state that soft budget constraints of banks lead to soft budget constraints of SOEs, which can lead to the situation that banks only finance worst firms. In addition, in spite of the liberalization, the domination of SOCBs still remained due to the undercapitalization of JCBs and the legislative constraints over FBs and JVBs (IMF, 1998) (see figure 16 for the market share of banks in Vietnam in the appendix). SOCBs are involved in all aspects of banking with national branch networks and focus on financing large SOEs even many of them are inefficient and unlikely to repay their loans (Vu and Turnell, 2010). Malesky and Taussig (2009) also found that in Vietnam SOCBs place greater value on political connections than performance in giving loan and that the firms with greater access to bank loans are no more profitable than firms without them. Unlike SOCBs, JCBs concentrate on providing universal banking services in particular areas, although some maintain networks of branches that allow them to operate on a multiregional or national basis. Their customers are often small SOEs, newly-established SMEs, and individuals. FBs are mainly geared to wholesale activities with a limited customer base and transaction points.

However, the reform programs still contributed to the Vietnamese banking system in improving staff skills, increasing transparency to assess the true size of NPL and raising profitability (IMF, 2002). As a result, the banking industry made much progress through the merger and acquisition of weak banks among the JCBs, the phasing away of government's intervention in lending from the SOCBs, and the decline in NPL achieved largely through loans growth and some write-offs (IMF, 2003). The autonomy and accountability of the commercial banks have been institutionalized and improved in practice, and they have the right to decide on deposit and lending interest rates, and select the form of loan security. Vietnamese banks are principally corporate lenders, and consumer banking remains underdeveloped. However, there are room for the Vietnamese banking system to grow when only 17% of the population have bank accounts in 2009 (Moody, 2009). The decreasing trend of the currency-to-deposit ratio shows payment through banking system is replacing cash payment (see figure 4). Currently, the government is trying to speed up banking reforms by announcing the 'Banking Sector Reform Roadmap' in 2006 with the aim to accelerate the restructuring of commercial banks and to gradually equitize SOCBs, increase capital capacity, promote competition in the industry, and apply international prudential standards especially the Basel II and III.

Figure 4: Currency to deposit ratio from 1995 to 2012



Source: ADB (2013)

The 10-year period of 2004-2013 witnessed the enlargement of the Vietnamese bank branch networks, the removal of many restrictions on the entry of FBs and the integration of Vietnam into the global economy. This is marked by the signing of a bilateral trade agreement with the US and becoming a member of the World Trade Organisation (WTO) in late 2006. Moreover, there were many substantial changes in banking technology, consisting of the application of banking software to computerize transactions, the development and expansion of automatic teller machine (ATM) networks, the issuing of debit and credit cards, and the development of internet and electronic banking services (Vu and Turnell, 2010). From 2007 to 2009, asset quality has improved when SOCBs cleaned up NPLs and made provisions in line with IFRS. In this period, the remarkable boom and burst of the Vietnamese securities market from 2004 to 2006, the impacts of the financial crisis in 2008 and the European debt crisis in 2012 also have effects on the Vietnamese banking system.

Due to the significant changes in the Vietnamese banking sector over the last decade, it is important to investigate the level of efficiency over this period. More specifically, it is necessary to find out how the level of efficiency of banks changed under the banking reforms, determinants of banks' profitability and if banks' efficiency affects banks' profitability, relationship between banks' size and their efficiency, which banks are the most and the least efficient, and whether FBs outperform SOCBs and JCBs in Vietnam. It appears that no studies have applied the SFA method to investigate the economic efficiency of banks in Vietnam over the 2004-2013 period. Earlier research on the performance of the Vietnamese banking sector used accounting financial ratios such as returns on assets (ROA), return on equity (ROE) or the cost to revenue ratio. The studied periods of most studies investigating the level of efficiency of banks in Vietnam are before 2006 (Nguyen, 2007; Nguyen and DeBorger, 2008 or Nguyen et al., 2010). Ngo's (2010) research is one of the few papers studying the level of efficiency after 2006, but he only focused the year of 2008. Moreover, there are only two studies applying SFA (Vu and Turnell, 2010 and Vu and Turnell, 2012), and Ngo's (2012) is the sole paper investigating the whole Vietnamese banking system while most studies took a sample from 13 to 32 commercial banks. Thus, this paper which covers the period 2004-2013 with 43 banks could provide a more comprehensive picture of bank performance in Vietnam.

3.2 Overview of the Vietnam's economy during period 2004-2013

3.3.1 The downturn and instability

In the last decade, the Vietnam's economy suffered a high inflation rate and an expansion of inefficient investments. The inappropriate management of foreign capital and monetary system and structural factors are considered the main reasons (Tran, 2013). First, in late 2006, Vietnam joined WTO, which has attracted foreign investment and then substantially increased the inflows of foreign capital. Tran (2013) argues that due to the lack of an appropriate monetary system, an expansion of money supply due to the unprecedented large inflows of foreign capital led to a high and volatile inflation rate. Specially, because of the absence of a liquid secondary government bond market, SBV had to buy excess supply of foreign exchange accumulated in commercial banks and hold it as foreign reserves (Pham and Riedel, 2012). The purchase of a large amount foreign capital by the Vietnamese local currency, called VND, resulted in an expansion of the money supply. This finally led to a surge in inflation rate from 7.76% in 2004 to 23.11% in 2008.

Second, in 2009, the government decided to reorganise and group major SOEs into conglomerates. It should be noted that these giant SOEs dominate key sectors of the Vietnamese economy and have abilities to influence the way how economic policies are imposed, which distorted the resource allocation. The government made a huge tranche of cheap credit available to these giant SOEs and they in turn used the cheap resources to diversify into many industries that they had little or no experiences. For instance, the giant oil company PetroVietnam invested in hotels, securities, real estate, insurance and even taxis. The monopoly ElectricityVietnam went to telecommunications and education. Meanwhile, the giant state-owned shipbuilding Vinashin invested in catering, insurance and distilling. The lack of experiences when investing in new industries led some giant SOEs into huge bad debts (Cordall, 2012). One of the biggest scandals recently is the event that Vinashin has declared the debt of VND 639 billion in 2010. This caused Habubank, the lender of Vinashin, had to be merged with the Saigon-Hanoi bank. Other state giants are not better when PetroVietnam, ElectricityVietnam and mining giant Vinacomin have debts of VND 72.3 billion, VND 62.8 billion and VND 19.6 billion. Pincus et al. (2012)

stated that SOEs accounted for 45% of new investment in the period of 2006–2010 but were responsible for only 19% of GDP growth. This caused an expansion and inefficiency of investment in Vietnam.

In 2011, the government announced the Resolution 11, whose aim is to cool down the overheated economy, and hence restore macroeconomic stability. The government cut public investment and increased interest rates to tighten credit and money supply to stabilize the economy. As expected, this Resolution 11 resulted in a substantial improvement in several macroeconomic indicators (Tran, 2013). However, the tightened policy has disadvantaged private firms, especially small- and medium-sized enterprises (SMEs) in accessing capital. At high interest rates, they were not able to afford funds for investment. The annual interest rate for lending by the SBV to commercial banks rose to 12% and 13% in March and April 2011, and the interest rate for lending from commercial banks to enterprises had to be much higher. Consequently, 100,000 firms (out of the total number of around 600,000 firms) had to suspend operations and were unable to pay taxes from 2011 to the mid-2012.

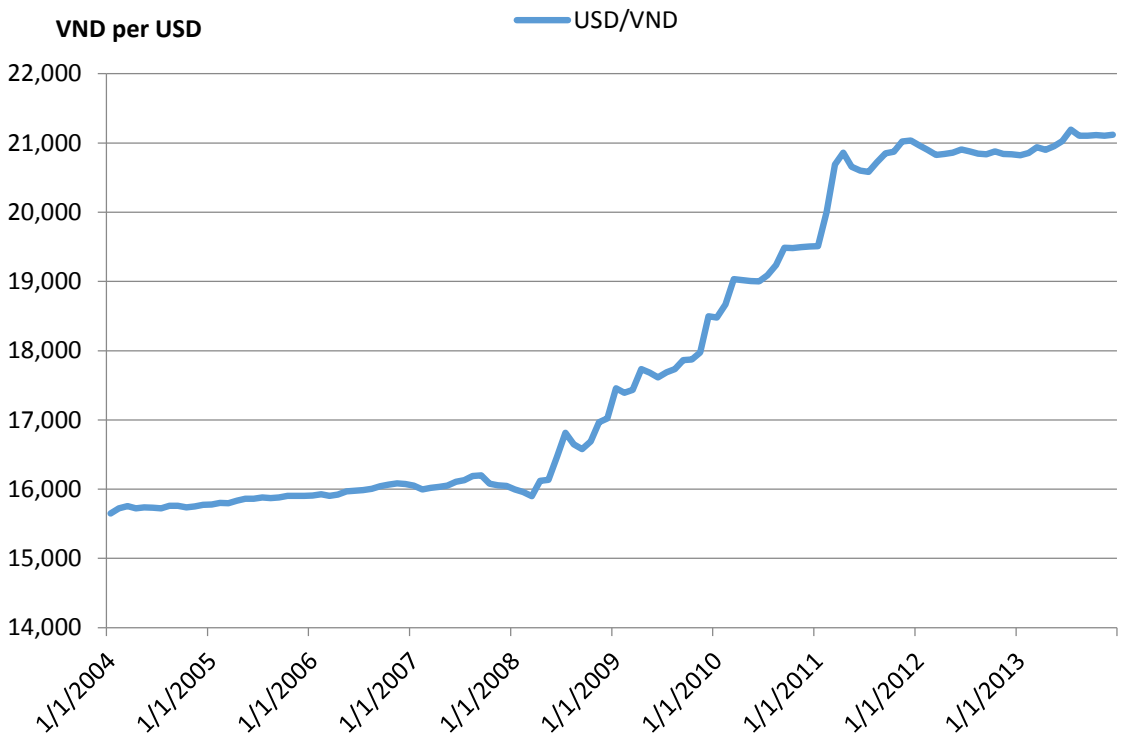
3.3.2 The impacts of the global financial crisis on Vietnam's economy

The global financial crisis started in 2008, but it influenced Vietnam's economy since early 2009. Interestingly, Thurlow et al. (2011) pointed out that the 2008 crisis improved Vietnam's terms of trade as it raised welfare and reduced poverty mainly by expanding exports in labour-intensive sectors. However, they also revealed that in 2009 the financial crisis reversed the welfare gains from 2008. Reductions in demand for exports, foreign direct investment (FDI), and remittances caused a contraction in the Vietnam's economy. The financial crisis pushed three million people below the US$2-a-day poverty line. In fact, the GDP growth rate of 5.39% in 2009 is second lowest GDP growth rate in the last decade.

Although Vietnam has witnessed strong domestic consumption growth in recent years, Vietnam's economy has continued to be driven by high external trade and increased foreign direct investment (Nguyen et al., 2011). As Vietnam's economy depends on export and FDI, the reduced demand in Vietnamese goods and the reduced foreign investment has made the economy suffered since the late 2008.

Financial crisis and economic recession in the U.S. and other major trade partners of Vietnam such as EU or Japan restrained their export growth rate to a considerable extent. The crisis exposed the vulnerability of Vietnam's export dependent growth on the world market. The volume of Vietnamese major export products, especially agriculture products such as coffee, rice, pepper, rubber, crude oil and coal increased in 2009. However, high inflation rate created pressure on the exchange rate, resulting in devaluations of the VND. The VND was dramatically devalued from about 16,000VND/USD in 2008 to about 21,000VND/USD in the mid-2011 (see figure 5). This led to the decrease in price of export products and hence adversely affected the exports. In fact, over the first ten months of 2009, Vietnamese exports decreased by 13.8% compared to 2008. IMF (2010) also reported that during this period the export growth to the European Union reduced from +60% to -30%.

Figure 5: Exchange rate USD/VND from 01/01/2004 to 31/12/2013



Source: OANDA

In 2009, there was a slowdown in the inflows of foreign direct investment resulted from the constraints of disposal capitals and the tightening of the world credit market. In 2008, there was a large inflow of FDI into Vietnam of $64 billion of registered

capital (tripled the registered FDI capital for 2007). Nevertheless, in the first eight months of 2009, Vietnam just managed to attract around $10.4 billion. The slowdown of FDI inflows in 2009 and the years to come will have serious consequences for Vietnam as the FDI sector plays an important role in Vietnam's export.

In order to combat the impacts of the global crisis, the government initially announced a fiscal stimulus package valued at $6 billion and later revised to be $8 billion. By increasing government spending, the objectives of the stimulus package are to boost investment and consumption, mitigate the impact of the global financial and economic crisis on the Vietnamese economy, maintain the stability and prevent a slowdown of economic activities. Noteworthy programmes in the package are a reduction of 30% of corporate income tax, an extension of nine months for the submission of 2009 tax payables, a temporarily refund of 90% of VAT for exported goods with justifiable payment documents, personal income tax exemption for the first 6 months of 2009 and 4% interest subsidy for loans of up to 2 years for investment in agriculture and other productive activities. Details about the stimulus measures are shown in the table 2. Nguyen et al. (2011) pointed out that the stimulus package was a timely push for the Vietnam's economy, it kept credit flowing to the economy and allowed the refinancing of enterprise debts contracted at very high interest rates. They also reveal that the interest rate subsidy created approximately 600,000 jobs during 2009.

Table 2: Vietnam's fiscal stimulus measure

No.	**Policy measures**	**Amount**
1	Interest subsidy	VND 17,000 billion
2	State development investment	VND 90,800 billion
3	Tax holiday and exemption	VND 28,000 billion
4	Other spending for social security and economic downturn prevention	VND 9,800 billion
	Total	**VND 145,600 billion**

Source: Nguyen et al. (2011)

CHAPTER 4: DATA AND METHODOLOGY

The sample for this research is drawn from banks operating in Vietnam between 2004 and 2013. The banks' accounting data is sourced mainly from the Bankscope Database and corporate data is collected through annual reports. World Bank Data is utilised to collect Vietnamese market data, some additional figures consisting of Vietnam GDP deflator, GDP growth, broad money growth and unemployment rate in 2013 are obtained from websites "economywatch" and "trading economics".

Data of 61 financial institutions in the 10-year period in Vietnam were collected from the Bankscope Database, consisting of 610 observations. All financial companies and Vietnam central bank were removed from the sample. Further, to be included into the studied sample, banks should meet the following conditions. They must have total assets, loans, fixed assets, equity, gross interest and dividend income, interest expenses, personal expenses, loan loss provision, total common equity, average loans and positive average equity. Hence, this finally yielded an unbalanced panel data of 43 banks and the number of observations fell to 207.

The list of banks in the studied sample is shown in the table 13 in the appendix. The studied sample comprises 43 banks operating in Vietnam over the period 2004-2013. These banks can be divided into three types of ownership.

I. State-owned commercial banks (SOCBs): they are entirely or partially owned by the government or state sector.

II. Joint stock commercial banks (JCBs): they are jointly owned by both the public and private sectors. They are organized as joint-stock companies, which have partnerships limited by shares.

III. Joint venture banks (JVBs) and Foreign banks (FBs): JVBs are 50% owned by foreign banks and 50% owned by a state-owned bank. FBs are 100% owned by foreign banks and belong to overseas-headquartered foreign banks.

4.1 Bank technical efficiency estimation

This paper is going to apply stochastic frontier analysis (SFA) which specifies a functional form for the cost, profit, or production relationship between inputs, outputs and environmental factors. Financial liabilities and physical factors are used as inputs into a translog function that is used to produce outputs as measured by various financial assets. The idea is to calculate an ideal frontier based upon the cost of production and/or input usage of the best practice or lowest cost firms in a sample. Using a functional form, such as a translog function, allows extrapolation away from actual data points to obtain an estimate of the minimum cost of production for any output level, or the minimum input usage for any level of total cost. Although stochastic cost function has been widely used in empirical research applying SFA, it has drawbacks in measuring relative efficiency in the service sector with multiple outputs (Drake and Simper, 2003). As output is the dependent variable, only a single output production process can be modelled. This is clearly not appropriate in banking which delivers a range of services or outputs. Further, efficiency produced by the stochastic cost function will be associated with both allocative efficiency (best possible use of given inputs to benefit the society) and technical efficiency (maximal output from given inputs). In contrast, the relative efficiency measures derived from non-parametric approaches typically relate only to technical efficiency. Hence, the relative efficiency measures derived from the stochastic cost function and techniques in non-parametric approaches are often not directly comparable.

The development of stochastic distance function introduced by Shepherd (1970) overcomes drawbacks of stochastic cost function. The distance function specification has the advantages of permitting the modelling of a multi-input, multi-output production process without the need to specify a behavioural objective (e.g., cost minimisation or profit maximisation). It also does not require input prices, which avoids bias in price. Moreover, as it is a function of outputs and inputs, the stochastic distance frontier provides a relative efficiency measure which is directly comparable to the measure of technical efficiency produced from non-parametric approaches that future research may apply to contrast the results (Drake and Simper, 2003). As a result, this paper is going to use distance function to estimate technical efficiency of the Vietnamese banking system.

Distance functions can be used to estimate the characteristics of multiple-output production technologies in cases where there is no price information and/or it is inappropriate to assume firms minimise costs or maximise revenues. When firms have more control over inputs than outputs, input distance functions tend to be used instead of output distance function, and output distance function will be used in the opposite case. As banks have more control over their inputs than outputs, this paper will use input distance function. Important properties of the distance function are that it is non-decreasing, linearly homogeneous and concave in inputs, and non-increasing and quasi-concave in outputs. The translog form is selected as the functional form for the distance function in this research. Thus, the input-oriented translog distance function with 3 inputs (x) and 3 outputs (y) for the panel data in this paper is:

$$lnd_{it} = \alpha + \sum_{n=1}^{3} \beta_n \, lnx_{nit} + \sum_{r=1}^{3} \theta_r \, lny_{rit} + \frac{1}{2}\sum_{n=1}^{3}\sum_{m=1}^{3} \lambda_{nm} lnx_{nit} \, lnx_{mit} + \frac{1}{2}\sum_{r=1}^{3}\sum_{s=1}^{3} \xi_{rs} lny_{rit} \, lny_{sit} + \sum_{n=1}^{3}\sum_{r=1}^{3} \phi_{ns} lnx_{nit} \, lny_{rit} + \tau t + \kappa t^2 \qquad (1)$$

Where d_{it} denotes the input distance, ln are the natural logarithms, β, θ, λ, ξ, ϕ, τ, and κ are parameters to be estimated, x_{nit} and y_{rit} are the n-th inputs and the r-th outputs respectively of the i-th bank at time t. This study adds the time components, t and t^2, as the longer the panel, the less likely it becomes that technology remains constant (Tente, 2011). This makes it desirable to include time among the regressors as a proxy for technical change, and doing so causes no unusual problems in estimation (Kumbhakar and Knox-Lovell, 2003, p.107). The function (1) is non-decreasing, linearly homogenous and concave in inputs if

$$\beta_n \geq 0 \; for \; all \; n \; \text{and} \sum_{n=1}^{N} \beta_n = 1 \qquad (2)$$

By substituting (2) into (1) and re-arranging, a homogeneity-constrained model is obtained as follows:

$$-lnx_{1it} = \alpha + \sum_{n=2}^{3} \beta_n \ln \frac{x_{nit}}{x_{1it}} + \sum_{r=1}^{3} \theta_R \, lny_{rit} + \frac{1}{2} \sum_{n=2}^{3} \sum_{m=2}^{3} \lambda_{nm} \, ln \frac{x_{nit}}{x_{1it}} ln \frac{x_{mit}}{x_{1it}}$$
$$+ \frac{1}{2} \sum_{r=1}^{3} \sum_{s=1}^{3} \xi_{rs} \, lny_{rit} lny_{sit} + \sum_{n=2}^{3} \sum_{r=1}^{3} \phi_{nr} \, ln \frac{x_{nit}}{x_{1it}} lny_{rit} + \tau t + \kappa t^2 + \varepsilon_{it} \quad (3)$$

The residual term of the model (3) can be decomposed:

$$\varepsilon_{it} = v_{it} - u_{it}$$

Where $u_i = \ln d_i$ is a non-negative variable associated with technical efficiency (TE)
v_{it} is the statistical noise

An appropriate predictor for TE is the conditional expectation of $\exp(-u_{it})$, given the random variable ε_{it}:

$$TE_{it} = E[\exp(-u_{it}) \, \mathrm{I} \varepsilon_{it}] = \frac{1}{d_{it}} = \exp(-u_{it}) \quad (4)$$

The TE defined in the model (4) does not take into account the possibility that different banks may experience different environmental conditions which may subsequently have an influence upon their technical efficiency levels.

4.1.1 Environmental influence

It is noted that macroeconomic factors, z variables, have an influence upon TE, thus it is necessary to take account of them. Generally, there are two ways to accommodate macroeconomic factors: one-step model and two-step models. Early empirical papers (see Pitt and Lee, 1981 and Kalirajan, 1989) adopt a two-stage estimation approach, where the first stage involves the specification and estimation of a stochastic frontier production function and the prediction of the technical efficiency scores. The second stage involves the specification of a regression model where the technical efficiencies are regressed upon macroeconomic factors. However, there is an inconsistency in this two-stage method. The stochastic frontier production function is estimated in the first stage under the assumption that the inefficiency effects are identically distributed, while in the second stage the predicted technical efficiencies are regressed upon a number of factors, hence suggesting the inefficiency effects are not identically distributed (Battese and Coelli, 1995). The two-

step procedures are considered to be biased when z and inputs variables are correlated in the first step of the two-step procedure. Wang and Schmidt (2002, p.144) argue that even if z and inputs variables are independent, the estimated inefficiencies are underdispersed as it ignores the effect of z on inefficiency. This causes the estimate of the effect of z on inefficiency in the second step in the two-step procedure to be biased downward toward zero. They also performed Monte Carlo simulation to investigate the performance pf the one-step and two-step estimators and found that the one-step estimators are based on a correctly specified model and are asymptotically optimal. Kumbhakar and Knox-Lovell (2003, p.264) also argue against the two-step model that the estimated efficiencies being explained in the second-stage regression in this procedure are biased estimates because they are estimated relative to a biased representation of the production frontier. Hence, it is not clear that even a "successful" second-stage regression contributes anything to the understanding of the determinants of efficiency variation.

Therefore, this study will apply the one-step procedure by incorporating the z variables directly into the frontier production function and estimate the efficiency effects in one-step using maximum likelihood estimation. Stata is employed for this process. Models of the form have been proposed by Kumbhakar, Ghosh and McGuckin (1991) and been applied to panel data by Battese and Coelli (1995). Under this approach, inefficiency term (u_{it}) is made an explicit function of a vector of environmental characteristics, z_{it} , by specifying that the u_{it} are independently (but not identically) distributed as nonnegative truncations of a general normal distribution of the form:

$$N(m_{it}, \sigma^2) \; or \; N\left[\delta_0 + \sum_{j=1}^{M} \delta_j z_{j,it}, \sigma^2\right] \qquad (5)$$

Where δ_0 and δ_j are parameters that need to be estimated.

The value of unknown parameters in (3) and (5): α, β_n, δ_0, δ_j, σ_u^2 and σ_v^2 are obtained simultaneously using maximum likelihood estimation. The estimates of these parameters are calculated by the use of reparameterisation (Coelli, 1992 and 1994):

$$\sigma^2 = \sigma_v^2 + \sigma_u^2 \text{ and } gamma\ (\gamma) = \frac{\sigma_u^2}{\sigma^2} = \frac{\sigma_u^2}{\sigma_u^2+\sigma_v^2}$$

This has advantages during estimation because the value of gamma must lie between zero and one. Battese and Coelli (1993) also present an expression for the conditional expectation of TE, given ε_{it}

$$TE_{it} = \left\{exp\left[-\mu_{it} + \frac{1}{2}\sigma_*^2\right]\right\} \times \left\{\Phi\left[\frac{\mu_{it}}{\sigma_*} - \sigma_*\right] \Big/ \Phi\left[\frac{\mu_{it}}{\sigma_*}\right]\right\} \quad (6)$$

Where $\Phi(.)$ denotes the distribution function of the standard normal random variable

$$\mu_{it} = (1-\gamma)\left[\delta_0 + \sum_{j=1}^{M} \delta_j z_{j,it}\right] - \gamma\varepsilon_{it}$$

And

$$\sigma_*^2 = \gamma(1-\gamma)\sigma^2$$

By replacing the unknown parameters in (6) with the maximum likelihood estimates, an operational predictor for the technical efficiency including the influence of environmental factors can be obtained. To compute net technical efficiency, researchers replace $\sum_{j=1}^{M} \delta_j z_{j,it}$ into (5) with min[$\sum_{j=1}^{M} \delta_j z_{j,it}$] and recalculate the technical efficiency predictions. Net efficiency scores are the efficiency levels when all firms are assumed to face identical environmental conditions.

Basing on the manual of frontier introduced by Coelli (1996), gamma (γ) is the variance ratio, illustrating the total variation in output from the frontier level of output attributed to technical efficiency. The value gamma of must lie between zero and one. If gamma is equal to one, the efficiency scores estimated would vary a lot across different banks within one year as the efficiency is determined by the disturbance errors of the model. If gamma is equal to zero, the efficiency scores estimated would be the same for each individual bank within one year. Therefore, a good model should have the value of gamma (γ) varies between zero and one but it should not be close to the value of either zero or one (Coelli, 1996).

4.1.2 Inputs and outputs selection

Generally, in the literature, there are two different methods that are used to measure bank services: production approach and intermediation approach. Under the former approach, banks are treated as firms employing capital and labour to produce services for both depositors and borrowers. Thus, outputs are measured by the number of deposit and loan transactions over time, while total costs are operating expenses. The latter approach treats banks as financial intermediaries between borrowers and depositors rather than producers of loan and deposit services. In this case, output is treated as a stock and measured by value of loans and investments, whereas total costs consist of operating costs and interest costs. Following Humphrey (1992), Berger (1993) and Esho (2001), this paper adopts the intermediation approach.

However, some authors have augmented outputs by adding off-balance-sheet activities. They argue that outputs may be understated if researchers measure solely the banks' balance sheets, especially with the fast growth of derivatives and securitization (see Jagtiani et al., 1995 and Stiroh, 2000). To address this issue, this paper adds non-interest operating income as the third output. The selected x inputs and y outputs are shown in the table 3 below:

Table 3: Variables used to estimate technical efficiency – unit: million VND

Variable	Description	Mean
x_1	Total interest expenses	2,950,929
x_2	Personal expenses	424,815.6
x_3	Other operating expenses	411,195.4
y_1	Gross loan	3.06e+07
y_2	Other earning assets	1.60e+07
y_3	Total non-interest operating income	389,347.2

Notes:

1. Total interest expenses (x_1): interest expense on customer deposits plus other interest expense

2. Personal expenses (x_2): listed in income statement. It is a part of total non-interest expenses.
3. Other operating expenses (x_3): listed in income statement. It is also a part of total non-interest expenses.
4. Gross loan (y_1): includes loans and reserves for impaired loans.
5. Other earning assets (y_2): represents investments and is listed in balance sheet.
6. Total non-interest operating income (y_3): represents off-balance-sheet activities. It includes net gains (losses) on trading and derivatives, net gains (losses) on other securities, net gains (losses) on assets at FV through income statement, net insurance income, net fees and commissions and other operating income

All financial variables in the table 3 are already adjusted based on Vietnam GDP deflator with the base year of 2004 to reflect their real changes. The purpose is to eliminate the inflation effects which can distort the efficiency estimation by magnifying or contracting the inputs and outputs from the real values. The summary of Vietnam GDP deflators for the studied period from 2003 to 2014 is in the table 4. The level of prices of all new, domestically produced, final goods and services in Vietnam more than doubled from 2004 to 2013; thus the efficiency estimation will be distorted considerably without adjustments for inflation.

Table 4: The summary of Vietnam GDP Deflators

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DGP deflator	100	109.20	118.56	129.97	159.44	169.36	189.80	230.16	255.31	278.05

4.2 Profitability determinants

To estimate the effects of TE on banks' profitability ratio and find out other determinants, this paper applies dynamic system-GMM panel model instead of the OLS or static panel estimates due to the following reasons. First, both static panel estimates and the OLS models omit dynamics, which causes the problem of dynamic panel bias (Bond, 2002 and Baum, 2006) and this confounds the study of the dynamics of adjustment (Baltagi, 2008). Omitted dynamics also means that studied models are misspecified, because they omit the entire history of the right-hand-side variables (Greene, 2008; Bond, 2002). Second, in this study's panel data set, there are 43 banks (N) which are analysed over the 10-year period (T). Many authors argue that the dynamic panel model is specially created for a situation in which "N" is bigger than "T" so as to control for dynamic panel bias (see Bond, 2002; Baum, 2006; Roodman, 2006; Sarafidis et al., 2006; Roodman, 2007; and Baltagi, 2008). Third, there is a need to test if TE is endogenous or exogenous in this research and it is easier to deal with the problem of endogeneity in the dynamic panel models than in the static and OLS models as they do not allow the use of internally generating instruments (Roodman, 2009a). An advantage of dynamic GMM estimation is that all variables (including lagged and differenced variables) from the regression that are not correlated with the disturbance term can be used as valid instruments (Greene, 2008). Finally, the static panel estimates and the OLS confound a separate analysis of the short and long-run effects of institutions on economic performance, thus the ability of dynamic panel model to identify both short-run impacts and long-run institutional effects is a another advantage (Baltagi, 2008 and Efendic et al., 2008). There reasons explain why the dynamic panel model is considered the most appropriate econometric technique for the estimation in this study.

It should be noted that technical efficiency in this research should be endogenous to ROE, which means it is affected by factors inside the studied model specifically inside the disturbance term. Technical efficiency reflects the effectiveness of banks to produce outputs (i.e. gross loan, other earning assets and non-interest operating income in this paper) given a set of inputs (i.e. interest expenses, personal expenses and other operating expenses), hence it is not largely due to bad luck. Instead, it is more likely there is a high degree of endogeneity because of poor risk management,

inefficient screening and monitoring, or making loan decisions without anticipating changes in the business cycle. Empirical studies investigating determinants of efficiency for banks are abundant. For example, Berger and DeYoung (1997) found loan loss provisions are negatively correlated with efficiency, Manlagnit (2010) reported a positive relationship between deposits-to-liabilities ratio and efficiency, or Cebenoyan et al. (1993) found a relationship between ownership and location and efficiency. As the OLS estimator will be consistent only if TE is exogenous, GMM is the more appropriate choice in this paper when TE is believed to be endogenous.

Although the General Method of Moments (GMM) provides consistent estimates under the dynamic panel models, there is a need to decide whether to use difference-GMM (DGMM) developed by Arrelano and Bond (1991) or system-GMM (SGMM) introduced by Arrelano and Bover (1995) and Blundell and Bond (1998). The former can perform poorly if the autoregressive parameters are too large or the ratio of the variance of the panel-level effect to the variance of idiosyncratic error is too large. The latter adds an additional assumption, that first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments, and can dramatically improve efficiency (Roodman, 2006). SGMM is a preferred choice over DGMM in this paper due to the following reasons. First, as the studied model specification includes macroeconomic variables (GDP growth and unemployment rate) which are known in economics for the presence of random walk statistical generating mechanism, SGMM is considered to be more appropriate than DGMM. This is because the SGMM estimate has an advantage over DGMM in variables that are “random walk” or close to be random-walk variables (Bond, 2002; Roodman 2006; Baum, 2006; and Roodman, 2007). Blundell and Bond (1998) shows that if a variable is close to a random walk, then DGMM performs poorly as past levels convey little information about future changes, so untransformed lags are weak instruments for transformed variables. Second, Baltagi (2008) argues that by improving precision and reducing the finite sample bias by allowing more instruments, the SGMM generally produces more efficient and precise estimates compared with DGMM.

Finally, as the studied panel data is unbalanced, it is better to avoid DGMM estimation because it has a weakness of magnifying gaps (Roodman, 2006, p. 19).

Therefore, SGMM is better compared to DGMM in this research. To estimate the effects of bank-specific (including TE), industry-specific, and macroeconomic factors on the profitability of Vietnamese bank, this study uses the following model:

$$Y_{it} = \alpha Y_{i,t-1} + \beta_{it} + \xi X_{it} + \delta V_{it} + \lambda Z_{it} + \varepsilon_{it}$$

Where:

i	: individual bank
t	: year
Y	: the dependent variable
Y_{t-1}	: the one period lagged of Y
X, V and Z	: bank-specific factor (including TE), industry-specific factor and macroeconomic factor variables
α	: coefficients of the lagged Y
β	: the bank specific intercept
ξ, δ and λ	: vectors of regression coefficients
ε	: the error term

4.2.1 Determinants and variable selection

Bank profitability determinants can be classified in three major categories which are bank-specify, industry-specify and macroeconomics factors. The chosen variables are presented below.

Profitability measures

The two main indicators for profitability in banking sector are return on assets (ROA) and return on equity (ROE). ROE is considered better as it can reflect both the essence of ROA and the equity multiplier[2] explaining the funds management efficiency (Rose and Hudgins, 2013). Thus, this paper is going to use ROE as a measure of Vietnamese bank profitability. This proxy has been used in many previous studies (see Tregenna, 2009 and Lipunga, 2014).

Bank-specific factors

The cost-to-income ratio (COSI1) measures the operational costs as percentage of income. Traditionally, the relationship between costs and profits appears

[2] $\text{Equity multiplier} = \frac{\text{Total assets}}{\text{Total equity capital}}$. $\text{ROE} = \text{ROA} \times \text{Equity Multiplier}$

straightforward (i.e. higher costs imply lower profits). Nevertheless, higher costs may also infer higher volume of activities, which can lead to higher profits. Goddard et al. (2009) found a positive relationship between this ratio and banks' profitability when studying eight European Union member countries, while Kosmidou (2008) found a negative relationship between them in Greece.

The ratio of average equity to average assets (EQAS1) is a measure of capital adequacy of banks to absorb shocks experienced. It is expected a positive relationship between it and ROE. In other words, the higher EQAS1, the lower the need to external funding, the lower the risk of going bankrupt, thus the higher ROE. The empirical studies observing this positive relationship between them are abundant (Pasiouras and Kosmidou, 2007 and García-Herrero et al., 2009).

The ratio of bank's loans to customer funding (LODEP) is a measure of liquidity management. Holding liquid assets helps banks dealing with problems relating to insolvency, but they are usually associated with lower rates of return. Thus, it is expected that LODEP is positively correlated with ROE (i.e. the higher LODEP, the lower liquidity, the higher profitability). This hypothesis is consistent with Flamini et al. (2009) who studied the determinants of commercial bank profitability in Sub-Saharan Africa.

The ratio of loan loss reserves to gross loan (LOSRES) is a measure of bank's asset quality. The higher reserves for impaired loans, the poorer the bank's asset quality, which negatively affects ROE (see Kosmidou, 2008). However, the risk-return hypothesis implies a positive relationship between risk and profits (i.e. the poorer the bank's asset quality, the higher rate charged, the higher return for banks) (see Dietrich and Wanzenried, 2011). Thus, LOSRES is expected to have either positive or negative impacts on ROE.

Bank's size (lnSize) is also an important determinant of its profitability. Large size may result in economies of scale that reduces cost so increases profit (see Berger and Humphrey, 1997 and Altunbas et al., 2001). However, there may be diseconomies of scale for larger banks with inefficient management leading to lower profit (see Vander Vennet 1998 and Pallage 1991).

The number of employees (EMP) is a measure of labour productivity. Athanasoglou et al. (2005) show that labour productivity has a positive and significant effect on bank profitability. Banks can target high levels of labour productivity growth via various strategies including keeping the labour force steady, ensuring higher quality of newly hired labour or reducing the total number of employees. Thus, a negative relationship between the number of employees and banks' profitability is expected in this paper.

Technical efficiency (TE) is the level of efficiency of a bank determined by comparing its actual costs to the best practice minimum costs to produce the same output under the same conditions (Berger and Mester, 1997). Basing on ES hypothesis, technical efficiency is expected to have a positive relationship with ROE. In fact, many studies found a positive relationship between technical efficiency and banks' profitability (see Maudos, 1998 and Timme and Yang, 1991).

Industry-specific factors

Concentration ratio (CR5) is calculated as the total assets held by the five largest banks divided by total assets. Based on the SCP hypothesis (Berger, 1995), banks in highly concentrated markets tend to collude and thus earn monopoly profit (see Short 1979, Molyneux et al. 1996 and Gilbert, 1984). However, Boone and Weigand (2000) argue that a higher bank concentration might be the result of a tougher competition in the banking industry, which would suggest a negative relationship between performance and market concentration. Therefore, the relationship between CR5 and ROE can be either positive or negative. It should be noted that as increased efficiency can lead to higher concentration and hence higher profits, the finding of a positive relationship between concentration and profits may be a spurious result. Berger (1995) argues that to verify the existence of the SCP hypothesis, this paper also needs to show that efficiency does not have effects on concentration and market power if the result indicates that CR5 is positively correlated with ROE.

Macroeconomic factors

GDP growth (GDPGR) is calculated as the annual change of the GDP. It is expected to have positive impacts on supply and demand for loans and deposits, thus a positive relation is expected between ROE and this variable. Bikker (2001) and

Athanasoglou et al. (2008) found a positive relationship between GDP growth and banks' profitability.

Unemployment rate (UNE) is also an important variable to control the effects of macroeconomic factors. In a good economic environment, banks are more capable of charging higher prices in the loan markets and earn higher profits. Hence, a negative relationship between unemployment rate and banks' profitability is expected (see Wong et al., 2007 and Bordeleau and Graham, 2010).

Table 5: Summary of variables selection and hypotheses

	Variables	Explanation	Calculation	Hypothesized sign with ROE
	ROE	Return on equity	$\frac{\text{Net income}}{\text{Equity}}$	
Bank-specific determinants	COSI1	Cost-to-income ratio	$\frac{\text{Total Expenses}}{\text{Net Income}}$	Positive Negative
	EQAS1	The ratio of average equity to average assets	$\frac{\text{Average Equity}}{\text{Average Assets}}$	Positive
	LODEP	The ratio of bank's loans to customer funding	$\frac{\text{Loans}}{\text{Deposits \& Short term funding}}$	Positive
	LOSRES	The ratio of loan loss reserves to gross loan	$\frac{\text{Reserves for Impaired Loans}}{\text{Gross Loans}}$	Positive Negative
	lnSize	Natural log of total assets	ln(total assets)	Positive
	TE	Technical efficiency	From the translog input distance function	Positive
	EMP	The number of employees		Negative
Industry-specific determinants	CR5	The concentration ratio	$\frac{\text{The assets of the 5 largest banks}}{\text{The assets of all banks}}$	Positive Negative
Macroeconomic determinants	GDPgrowth	The gross domestic product growth	The annual change of the GDP	Positive
	UNE	Unemployment rate		Negative

4.2.2 Validity of SGMM results

The use of SGMM requires a number of conditions for the results to be reliable:

The Angrist-Pischke (AP) F statistics is the test of weak identification of individual endogenous regressors. It is constructed by "partialling-out" linear projections of the remaining endogenous regressors. "Weak identification" occurs when the excluded instruments are weakly correlated with the endogenous regressors. When instruments are weak, estimators will perform poorly, and different estimators are more robust to weak instruments than others (Stock and Yogo, 2005). The test is an F version of the Cragg-Donald Wald statistic and is automatically reported by the code “ivreg2” in Stata. The null hypothesis in this test is endogenous regressor is weekly identified; hence the AP test will fail to reject if a particular endogenous regressor is weekly identified. Critical values for the AP F test of weak identification are not available, but the Stock-Yogo (2005) critical values for the Cragg-Donald F statistic (when number of endogenous regressors = 1) can be used to compare with the test statistic. Besides the results of the AP test, selected instruments should be significantly correlated with the endogenous regressor (i.e. TE).

The second test is the underidentification test which is also automatically reported by the code “ivreg2” in Stata. It is an LM test of whether the equation is identified or not. The test is the test of the rank of a matrix and the null hypothesis is that the equation is underidentified. If L1 is the number of excluded instruments and K1 is the number endogenous regressors, the statistic is distributed as chi-squared with degrees of freedom = (L1-K1+1). A rejection of the null indicates that the matrix is full column rank, which means the model is identified.

The next test is the test of joint significance of endogenous regressors. The Anderson-Rubin (1949) test and the Stock-Wright (2000) S statistic can be implemented for this purpose. They are robust to the presence of week instruments. The null hypothesis for both tests is that the coefficients of the endogenous regressors in the structural equation are jointly equal to zero. Under “ivreg2”, the Anderson-Rubin statistic is a Wald test and the Stock-Wright S statistic is a GMM-distance test. Both test statistics distributed as chi-squared with L1 degrees of freedom where L1 is the number of excluded instruments. For further discussion

about these two tests, see Dufour (2003), Chernozhukov and Hansen (2005) and Kleibergen (2007)

The test of endogeneity is the fourth test. The null hypothesis is that the specified endogenous regressors (TE in this research) can actually be treated as exogenous, the test statistic is distributed as chi-squared with degrees of freedom equal to the number of regressors tested. The test can be implemented using the “endog” option under the “ivreg2”. If TE is exogenous, OLS will be the more appropriate choice in this paper. If TE is endogenous, the SGMM will be the preferred one.

The test for autocorrelation in the disturbance term is the next test. The SGMM approach assumes linearity and that the error terms are not autocorrelated, or in other words that the applied instruments in the model are exogenous. As a result, the test for the presence of first-order and second-order autocorrelation in the error term is particularly important (Efendic et al., 2008, p. 12). According to Arrelano and Bond (1991), the GMM estimator requires that there is first-order serial correlation but that there is no second-order serial correlation in the error terms. As their null hypotheses are that there is no first-order and second-order serial correlation respectively, one needs to reject the null hypothesis in the former test but not to reject it in the latter test to obtain appropriate diagnostics.

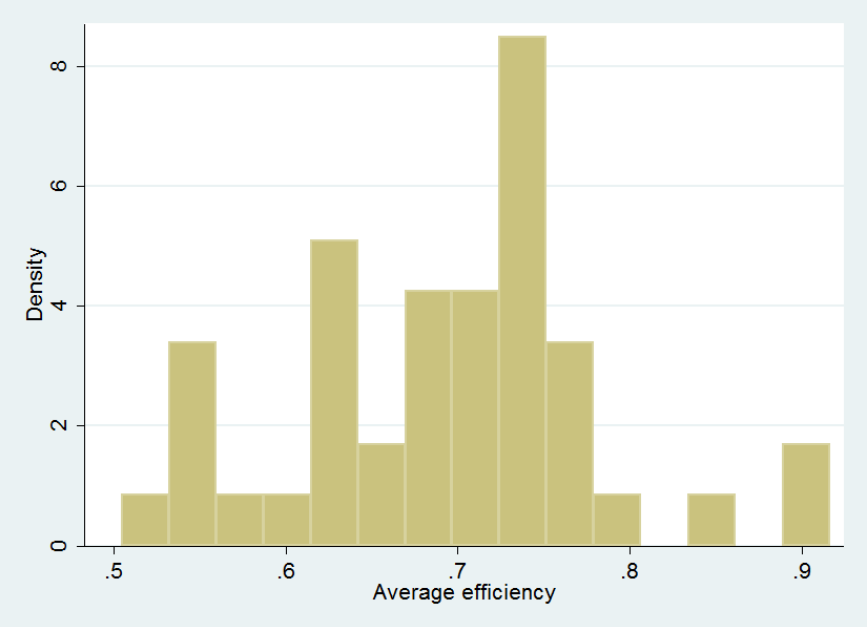
Finally, the Hansen test of overidentifying restrictions needs to be implemented. The null hypothesis is that the instruments are valid instruments and uncorrelated with the error term, and that the excluded instruments are excluded from the model correctly. The test statistic is distributed as chi-squared in the number of overidentifying restrictions. A rejection casts doubt on the validity of the instruments, but “do not reject” may cast the risk of generating results that are invalid and appear valid due to too many instruments (Roodman, 2009b). Roodman (2009b) argues that there are no clear rules concerning how many instruments is “too many”, but there are some rules of thumb and telltale signs which can be used. The number of instruments should not exceed the number of observations. Besides that, the p-value under the Hansen test should have a higher value than the conventional 0.05 or 0.10 levels, at least 0.25 (Roodman, 2007, p.10).

CHAPTER 5: EMPIRICAL RESULTS

5.1 Efficiency analysis

According to the table 6, the average efficiency of Vietnamese banking system from 2004 to 2013 is 0.738, which suggests that a typical bank wastes around 26.2% of its costs relative to the best-practice banks. In other words, on average, a bank needs to reduce 26.2% of its inputs so as to be as efficient as the best practice bank. Most banks have the average efficiency scores ranging from 0.72 to 0.75 (see figure 6). The highest average technical efficiency over the period was 0.947 belonging to Mekong Development Joint Stock Commercial Bank in 2012, and the lowest one was 0.338 belonging to Ocean Commercial Joint Stock Bank in 2007. It should be noted that 2007 also witnessed the lowest average efficiency of 0.569 for the Vietnamese banking system in the last decade due to the "bubble and trouble" in the Vietnamese security and real estate markets. Further, the low efficiency scores of 0.587 in 2009 and 0.626 in 2012 also shows that the global financial crisis and the European debt crisis started in 2008 and 2012 respectively had negative impacts on the efficiency level of banks in Vietnam.

Figure 6: Density plot for the average scores of banks in Vietnam from 2004 to 2013.



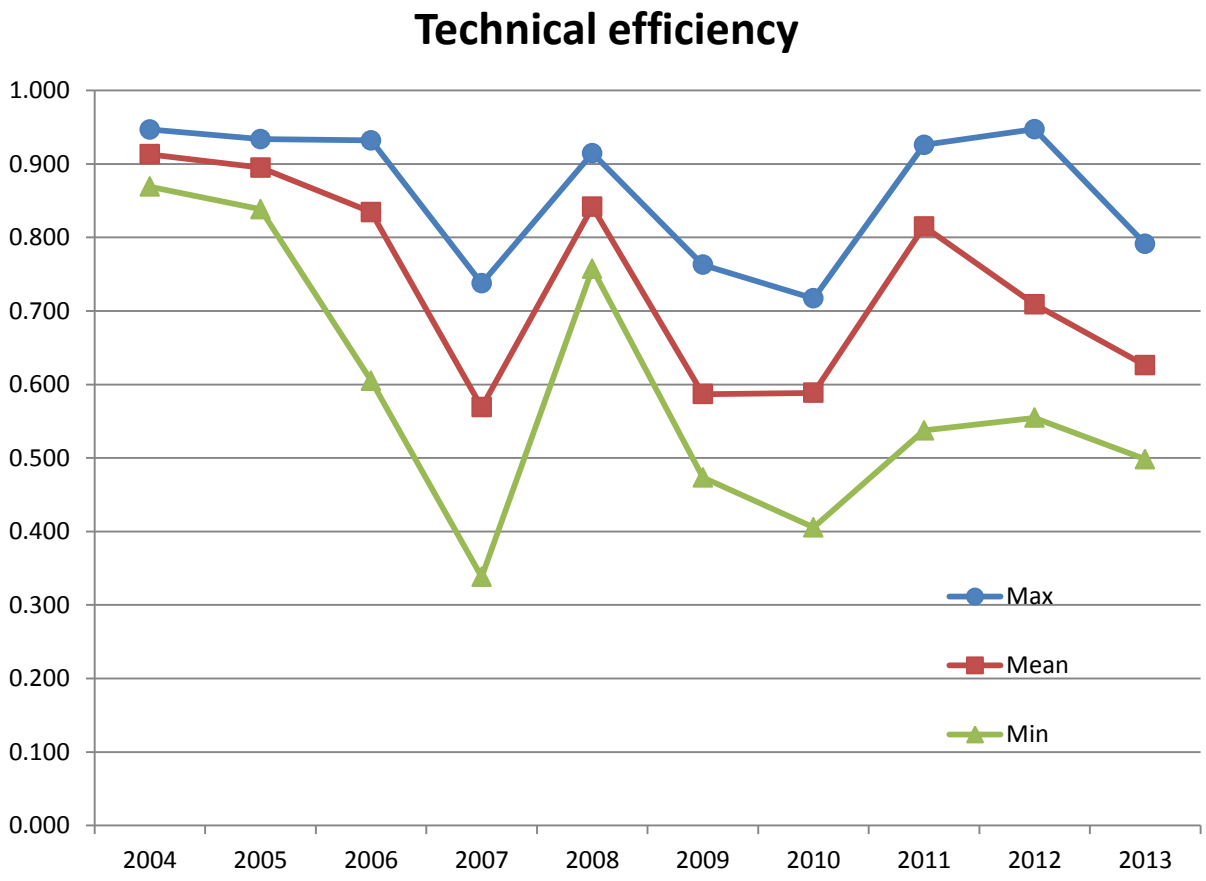
Source: Author's calculation

Table 6: Estimated average technical efficiency scores for Vietnamese banks from 2004 to 2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Max	0.947	0.934	0.932	0.738	0.914	0.763	0.717	0.926	0.947	0.791	0.861
Mean	0.913	0.895	0.834	0.569	0.842	0.587	0.589	0.815	0.709	0.626	0.738
Min	0.869	0.838	0.605	0.338	0.757	0.473	0.406	0.537	0.555	0.498	0.588

The gamma is 0.6598 which is not close to either zero or one, thus the findings of Vietnamese banks' technical efficiency in this paper are reliable

Figure 7: Technical efficiency of the Vietnamese banking system from 2004 to 2013



The estimated banks' efficiency reflects the true situation in Vietnam during the last decade. Overall, the technical efficiency of Vietnamese banks experienced a downward trend, with the gap of efficiency between the most efficient banks and the least efficient banks widening. This is in line with many studies investigating the level of efficiency of banks in Vietnam (see Vu and Turnell, 2010; Ngo, 2012 and Nguyen and DeBorger, 2008). There was a slight decrease in the average efficiency from 0.913 in 2004 to 0.834 in 2006 due to the poor sequencing banking reforms as previously mentioned in the Vietnamese banking system analysis (see Le, 2006).

Specifically, the recapitalization process was implemented too early when the Vietnamese banking system was quantitatively and qualitatively inadequate resulting in a quick rise in the establishment and then collapse of many undercapitalized but over-leveraged financial institutions. Further, soft budget constraints caused by recurrent recapitalizations also encouraged banks to make inefficient loans to many inefficient SOEs, the situation got worse when banks in Vietnam place greater value on political connections by giving loans to SOEs even they are not profitable (Malesky and Taussig, 2009).

The dramatic reduction in efficiency to the bottom of 0.569 in 2007 can be explained by the “bubble and trouble” of the Vietnamese security and real estate in 2006. Nguyen (2007) argues that the unbelievable rise in the Vietnamese index stock market by 145% in 2006 was due to the herding behaviour of Vietnamese investors and the entry of Vietnam in WTO. He reveals that the true value of securities in 2006 could be only a half of the market price. Consequently, in 2007, when the Vietnamese stock market index, called VNIndex, considerably dropped from the peak of 1200 points in March to 887 points in August, overpriced assets as collateral for bank loans and overpriced stock price had negative impacts on the banking systems when investors cannot pay back their loans and overpriced collateral cannot cover the debts. Ngo (2012) also showed that the level of efficiency reached the bottom of 0.494 when investigating the performance in the Vietnamese banking system from 1990 to 2010.

In 2008, the increase in efficiency is probably the result of loose monetary policy of the SBV in order to encourage economic growth. Before the announcement of the Decision No. 16/2008/QD of the SBV in regulating interest rate, commercial banks' lending interest rate was rather high (about 19% in March 2008). Since then, commercial banks' lending interest rate was controlled within a cap of 18% in May 2008. Later on, the SBV lowered the base interest rate, thus lending rate offered by financial institutions continued to decrease. Finally, lending rate reduced to 10.8%-11.5%, 12%-12.75% and 8.5%-10% per annum for short-term, medium and long-term loans, respectively (SBV annual report, 2008, p.30). Besides lowering lending interest rate, many commercial banks also increased their deposit interest rates to 17.5-18.5% per annum to prevent deposit mobilization slowdown. SBV reported that

some JCBs even mobilized at 19% per annum along with various promotions (SBV annual report, 2008, p.27). As a result, this increased banking activities as well as narrowed interest rate spreads, which forced banks to become more efficient in attracting deposits and giving loans. Furthermore, the increase in efficiency in 2008 can be due to the entry of FBs. The year 2008 is the first time ever 100% foreign-owned banks (i.e. HSBC, Standard Chartered and ANZ) are licensed to operate in Vietnam. Many studies found that foreign bank entry improves the efficiency of domestic banks by narrowing interest rate spreads and reducing operating expenses (see Claessens et al., 2001, McFadden, 1994, or Unite and Sullivan, 2002). Ngo (2010) also reported a high average of efficiency scores of banks in Vietnam in 2008 and concluded that they are relatively efficient compared to each other.

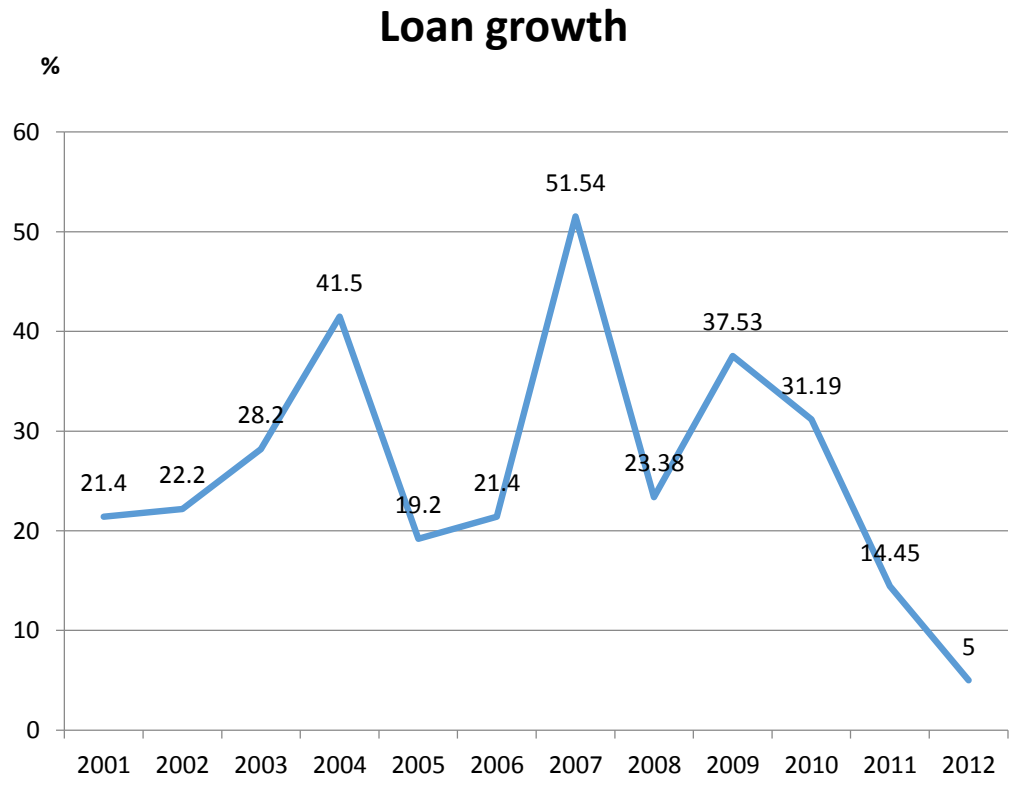
The reduction in efficiency scores in 2009 can be primarily attributed to the instability of the Vietnam's economy caused by the global financial crisis. The global financial crisis started in 2008, but it hit Vietnam's economy since early 2009. Although Vietnam belonged to the minority group reporting rises in 2009, the GDP growth rate of 5.39% in 2009 is one of the lowest growth rates for the country in the last 20 years. Vietnam's economy is dependent on export and FDI. The devaluation of VND by 12.5% compared to the US$ (the major trade partner of Vietnam) in 2009 had negatively impacts on Vietnam's exports. Further, the influx of FDI into Vietnam in 2009 was only $10.4 billion compared to $64 billion in 2008 due to the tightening of the credit market in Japan. These led to serious consequences for the Vietnam's economy. Thurlow et al. (2011) reported that the financial crisis pushed a million workers into unemployment and three million people below the $2-a-day poverty line. However, a timely $8 billion fiscal stimulus package imposed by the government in 2009 has played an important role in recovering the Vietnam's economy. Under the package, the interest subsidy implemented in 2009 in which the government helped offset 4% off interest rates on loans which enterprises obtain from commercial banks was well received and highly appreciated by many scholars and practitioners in increasing the banking sector's capitalization and improving competitiveness (see Nguyen et al., 2011 and Moody, 2009). As a result, a slight recovery in efficiency was witnessed from 2009 to 2010.

The considerable rise in the average banking efficiency to 0.815 in 2011 can be due to the adoption of the Restructuring Financial Institutions 2011-2015 program under the Decision No. 254/QD-TTg. This put strong emphasis on Vietnam striving to have one or two banks of regional stature by 2015. SOCBs played a leading role in restructuring the banking system with large scale, safe and efficient operation, advanced management capability, and enhanced competitiveness. Bad debts of SOCBs were controlled at about 3% of total loans pursuant to the Vietnam Accounting System and three out of the four major SOCBs. Further, the government also promoted the equitisation for the biggest SOCB, namely Agribank. Under the programme, JCBs were assessed with regard to their financial conditions, operation, management, quality of their assets, liabilities, and safety levels to be classified into three groups: healthy, temporary short of liquidity, and weak. The purpose is to create favourable conditions for healthy banks to further develop and extend refinancing credits for banks in lack of liquidity, while weak banks were encouraged and forced to restructure through merge and acquisition or the SBV will buy back their shares. For example, the three weak banks, SCB, TinNghiaBank and FicomBank, were merged to form Saigon Commercial Bank in the end of 2011. Additionally, weak JCBs will be closely and comprehensively supervised by the SBV in terms of management, governance, financial conditions and operation. For FBs, they were encouraged to have holdings in domestic banks to compete equally as well as to conduct business cooperation with domestic credit organisations. Limit on fund mobilization for FBs was also lifted since the beginning of 2011. Close links between domestic and FBs helped develop products, improve governance and modernise technology.

The year 2012 witnessed many difficulties for the Vietnamese banking system. In February 2012, the “loan growth restriction” programme under the Decision 01/2012 CT in which banks were divided into four different groups with four different loan growth limits, 17%, 15%, 8% and 0% led to the situation where many enterprises could not access to bank loans while many banks with excess fund were not allowed to make loans due to the restriction (Minh, 2012). Consequently, 2012 witnessed the lowest loan growth of 5% since 2001 (see figure 8). In June 2012, the SBV reported that bad debts surged to 8.6% (202 trillion VND) for the whole banking system. This was first time ever that the SBV officially discloses bad debts of commercial banks

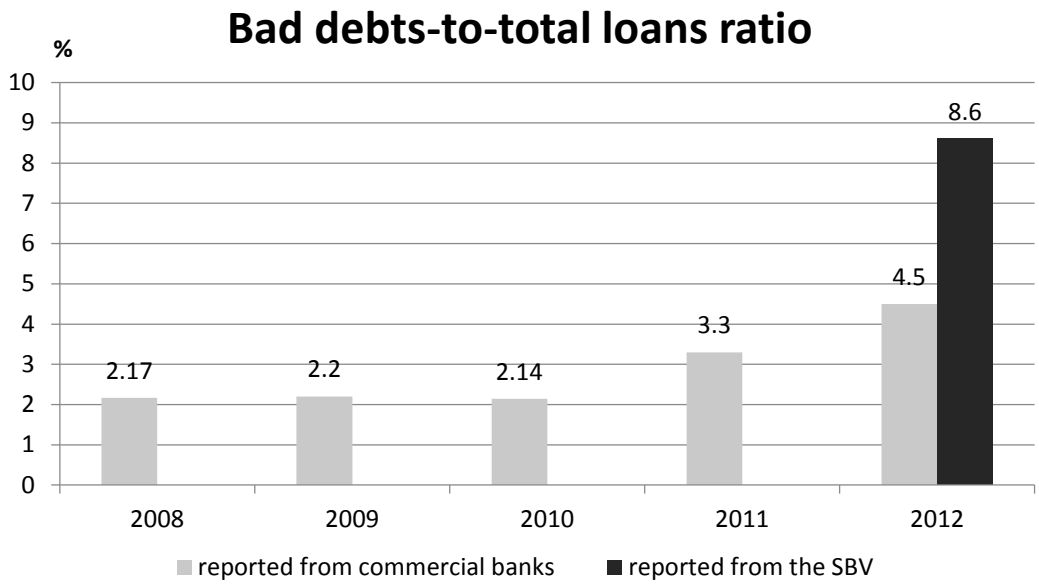
and the SBV also criticised commercial banks for the concealment of bad debts (see figure 9). Nguyen Van Giau, the governor of the SBV, also revealed that about 20 banks had NPLs of above 22% and 2 banks had NPL of above 50%. He also explained that loans given to many inefficient enterprises together with the improper supervision from the SBV were the main reason leading to high bad debts (Le, 2013). One of the main reasons leading to inefficient enterprises can be due to the effects of the European debt crisis in 2012 accounting for about one fifth of the total exports of Vietnam. In August 2012, the arrest of the banking tycoon Nguyen Duc Kien, co-founder of Asia Commercial Joint Stock Bank (ACB), one of the biggest JCBs, dampened public confidence in the banking system. He and his accomplices caused losses of $67 million through illegal cross-bank deposits and investments. He was also found guilty of fraud, tax evasion and “deliberate wrongdoing causing serious consequences”. As a result, the average efficiency score reduced to 70.9% in 2012 after an increase in 2011.

Figure 8: Loan growth the Vietnamese banking system from 2001 to 2012



Source: SBV annual report 2012

Figure 9: Bad debts-to-total loans ratio of the Vietnamese banking system from 2008 to 2012

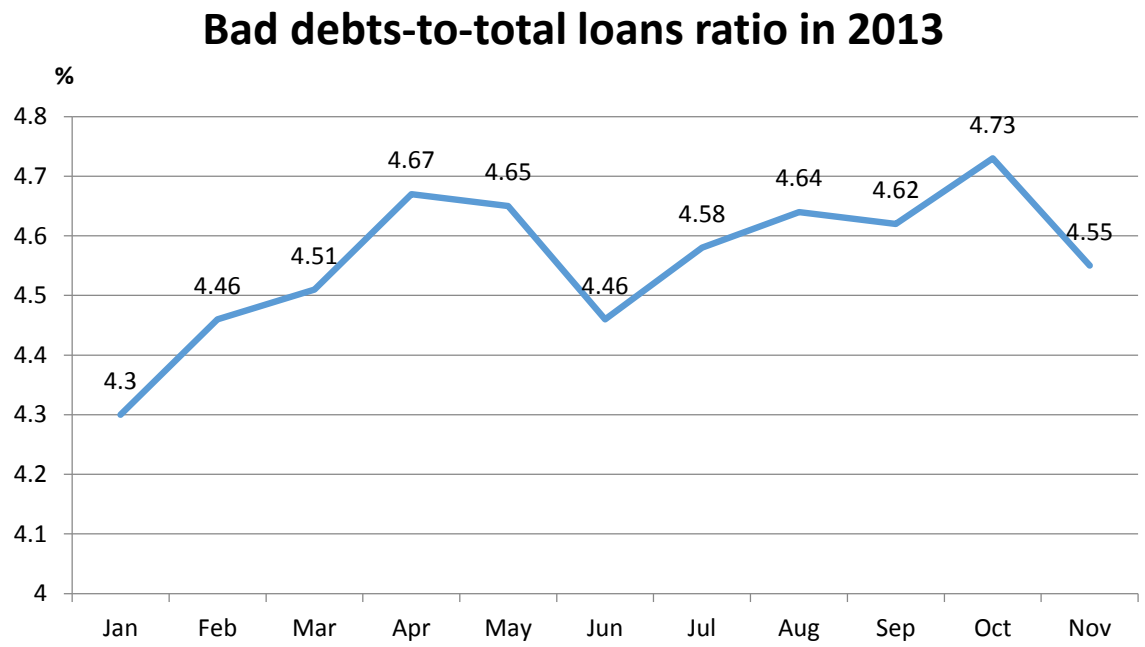


Source: cafef (2012) and Le (2013)

In 2013, in order to deal with bad debts, the government established the Vietnam asset management company (VAMC) under the Decree 53/2013/ND-CP to buy bad debts from banks by issuing special bonds authorized by the SBV. In October 2013, VAMC bought back about 39 trillion VND, thus the bad debts-to-total loans ratio for the banking system reduced to about 4.5% on average in 2013 (see figure 10). However, Trinh (2013) argues that reported numbers from VAMC cannot explain anything and bad debt problem of the system still remains unsolved as it depends on many macroeconomic factors and the ability of borrowers to repay the loans not just the purchase of VAMC. He also argues that bad debts should be resolved collectively not individually like what individual banks are doing currently as it can reduce the transparency of the system. In addition, so as to increase loan growth in 2013, the SBV reduced the lending interest rate by 3% for short-term loans and 1% for long-term loans. On average, the lending interest rate reduced by 2-5% compared to the year 2012 to about 8-9% per annum, some enterprises can even borrow at 7% per annum (cafef, 2013). Nevertheless, Trinh (2013) argues that the reduction in lending interest rate could not increase the loan growth as expected because the demand on bank loans of enterprises was rather low due to the slowdown in economy. For example, the profit of rubber-producing and minerals-

exploiting enterprises reduced by over 30% and 60% respectively in the third quarter of 2013. As a result, the average efficiency score continued to reduce to 62.6% in 2013 in spite of the efforts of SBV in solving bad debts and boosting the loan growth.

Figure 10: Bad debts-to-total loans ratio of the Vietnamese banking system in 2013



Source: Trinh (2013)

5.1.1 Ranking

The efficiency scores are only relative to best firms in the sample. They only reflect the dispersion of efficiencies within the studied sample and say nothing about the efficiency of one sample relative to the other (Coelli et al., 2005, p.314), thus efficiency ranks can provide a better picture of the studied sample as it can tell readers how an individual bank is more efficient than other banks in the sample. Berger et al. (2005) also argues that the use of efficiency ranks is preferred over the efficiency scores as the ranks are more comparable across time.

The ranks are then converted to a uniform scale over [0,1] using the formula: (order-1)/(n-1) where order: the average ranking of efficiency, n: the number of banks. The bank with the lowest cost efficiency level has the worst rank of 0 and the bank with the highest cost efficiency level has the best rank of 1. There is a fixed distribution of [0,1] for the ranks for every time period, while the distributions of efficiency levels

may be very different, depending on conditions in the time period. The efficiency scores are converted into the efficiency ranks as following table.

Table 7: Rankings of efficiency throughout the period of 2004-2013

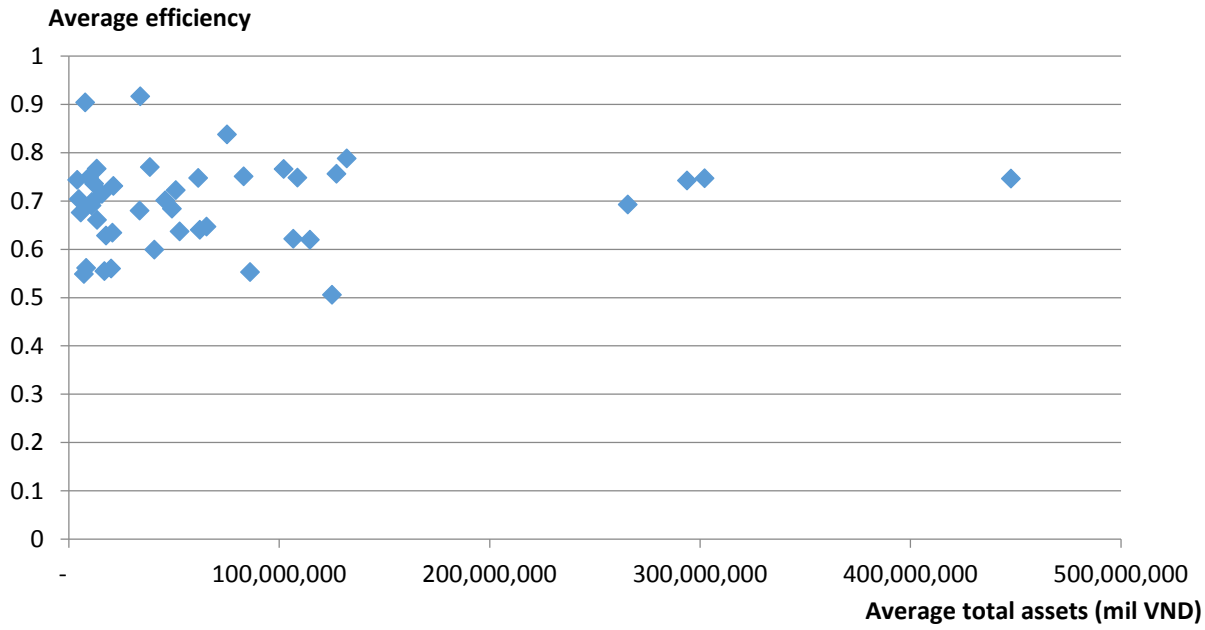
Type	Bank name	Average efficiency	Berger ranking	Average total assets (mil VND)	Asset ranking
FB	ANZ Bank (Vietnam) Limited	0.9161403	1	33,964,300	24
JCB	Southern Commercial Joint Stock Bank	0.90331185	0.98	7,763,229	39
JCB	Southern Bank-Phuong Nam Commercial Joint Stock Bank	0.8372738	0.95	75,269,552	14
JCB	Vietnam Technological and Commercial Joint-Stock Bank – Techcombank	0.78763886	0.93	132,186,261	5
SOCB	Housing Bank of Mekong Delta – MHB	0.7695871	0.90	38,533,519	23
JCB	Orient Commercial Joint Stock Bank	0.76648783	0.88	13,340,489	33
JCB	Vietnam Maritime Commercial Stock Bank	0.76542582	0.86	102,126,260	11
JCB	Asia Commercial Joint-stock Bank – ACB	0.75589884	0.83	127,194,700	6
JCB	VietNam International Commercial Joint Stock Bank – VIB	0.75026755	0.81	83,168,625	13
JCB	Vietnam Asia Commercial Joint-Stock Bank	0.74867414	0.79	9,711,826	37
JCB	Saigon Thuong Tin Commercial Joint-Stock Bank – Sacombank	0.7477845	0.76	108,644,813	9
JCB	Vietnam Prosperity Joint Stock Commercial Bank – VP Bank	0.74699227	0.74	61,555,786	17
SOCB	Vietnam Joint-Stock Commercial Bank for Industry and Trade – Viettinbank	0.74636638	0.71	302,286,078	2
SOCB	Vietnam Bank for Agriculture and Rural Development – Agribank	0.74593909	0.69	447,743,014	1
FB	Hong Leong Bank Vietnam Limited	0.7428483	0.67	4,088,977	43
SOCB	Bank for Investment and Development of Vietnam – BIDV	0.74187394	0.64	293,799,910	3
JCB	Mekong Development Joint Stock Commercial Bank	0.73494633	0.62	12,034,978	34
JCB	Nam A Commercial Joint Stock Bank	0.73038957	0.60	21,226,767	26
JCB	Lien Viet Post Joint Stock Commercial Bank	0.72165918	0.57	50,898,185	19
JCB	Petrolimex Group Commercial Joint Stock Bank – PG Bank	0.71395908	0.55	15,782,398	31
JVB	Vietnam-Russia Joint Venture Bank	0.7033043	0.52	4,777,978	42
JCB	An Binh Commercial Joint Stock Bank – Abbank	0.70078913	0.5	45,799,775	21
JCB	Saigon Bank for Industry and Trade	0.69768087	0.48	11,088,633	35
SOCB	Joint Stock Commercial Bank for Foreign Trade of	0.6924528	0.45	265,636,530	4

	Vietnam – Vietcombank				
JCB	North Asia Bank	0.69040085	0.43	10,931,450	36
JCB	Saigon Commercial Bank – Saigonbank	0.68326246	0.40	49,054,629	20
JCB	Ngan hang Thuong mai Co Phan Bac A – BAC A Bank	0.6793756	0.38	33,738,283	25
JVB	VID Public Bank	0.67535941	0.36	5,752,400	41
JCB	Bao Viet Commercial Joint Stock Bank	0.6606589	0.33	13,409,700	32
JCB	Southeast Asia Commercial Joint Stock Bank – SEA Bank	0.64612695	0.31	65,499,467	15
JCB	Saigon-Hanoi Commercial Joint Stock Bank	0.63956134	0.29	62,343,394	16
JCB	DongA Commercial Joint Stock Bank	0.63618547	0.26	52,774,120	18
JCB	Tien Phong Commercial Joint Stock Bank	0.63378852	0.24	20,742,289	27
JCB	Nam Viet Commercial Joint Stock Bank – Navibank	0.62758958	0.21	17,776,365	29
JCB	Military Commercial Joint Stock Bank	0.62156669	0.19	106,774,812	10
JCB	Vietnam Export Import Commercial Joint Stock Bank	0.61905061	0.17	114,582,286	8
JCB	Ocean Commercial Joint Stock Bank	0.59879978	0.14	40,632,783	22
JCB	Viet Capital Commercial Joint Stock Bank	0.5611634	0.12	8,225,404	38
FB	Shinhan Bank Vietnam	0.55989798	0.10	20,180,850	28
JCB	Viet Nam Thuong tín Joint Stock Commercial Bank – Vietbank	0.5544142	0.07	16,900,200	30
JCB	Ho Chi Minh City Development Joint Stock Commercial Bank	0.5520613	0.05	86,226,641	12
JCB	Global Petro Commercial Joint Stock Bank	0.5484213	0.02	7,214,810	40
JCB	Vietnam Development Bank – VDB	0.5051674	0	125,137,925	7

According to the table 7 and the figure 11, it seems that there is not any significant efficiency advantage for large banks. This is in line with the findings of Berger and Mester (1997) and Pi and Timme (1993). The average efficiency level of the four largest banks in Vietnam, Argibank, Viettinbank, BIDV and Vietcombank (in decreasing order) are better than 69%, 71%, 64% and 45% of other banks respectively. The efficiency level of the smallest bank, Hong Leong Bank, is better than 67% of other banks. The most efficient banks in Vietnam are middle-sized banks (the twenty-fourth, thirty-ninth and fourteenth positions in the asset ranking), which is consistent with the finding of Maudos et al. (2002) who found that medium-sized banks reach the highest levels of efficiency.

The table 7 reflects the true situation of banks in Vietnam in terms of efficiency level. According to the table, it should be noted that Techcombank is the fourth most efficient bank in Vietnam. In 2014, Techcombank is awarded the best Commercial Bank Vietnam 2014, the Best Customer Service Bank Vietnam 2014, the Best Internet Bank Vietnam 2014 and the Best Internet Bank Vietnam 2014 from the Global Banking & Finance Review (Global Banking & Finance Review, 2014). The table also shows that the efficiency level of Tien Phong Commercial Joint Stock Bank is only better than 24% of other banks. In 2011, Tien Phong Commercial Joint Stock Bank was almost forced to be merged with other banks by the SBV due to being categorised as "weak bank" under the Restructuring Financial Institutions 2011-2015 programme as previously stated. The entry of the two new major shareholders with holdings of 20% (Do Minh Phu, the chairman of DOJI Group and Do Anh Tu, the general director of Diana) saved the bank from being merged (Tienphong bank annual report, 2013).

Figure 11: Relationship between efficiency and size of banks in Vietnam



Source: Author's calculation

5.2 Profitability's determinants analysis

5.2.1 Test results for the validity of SGMM

The validity of the obtained results from the SGMM is dependent on the statistical diagnostics, thus this part is going to interpret the model diagnostics.

Table 8: Model diagnostics	
Number of observations	129
Number of instruments	33
Angrist-Pischke (AP) F test *H_0: endogenous regressor is weekly identified*	F(2, 116) = 17.43
Underidentification test *H_0:the studied model is underidentified*	Chi-sq(2) = 21.06 P-val = 0.0000
Tests of joint significance of endogenous regressors Anderson-Rubin test *H_0: coefficients of the endogenous regressors are jointly equal to zero* Stock-Wright (2000) S Statistics *H_0: coefficients of the endogenous regressors are jointly equal to zero*	 Chi-sq(2) = 24.19 P-val = 0.0000 Chi-sq(2) = 14.52 P-val = 0.0007
Endogeneity test *H_0: endogenous regressors can be treated as exogenous*	Chi-sq(2) = 10.706 P-val = 0.0011
Arellano-Bond test for AR(1) in first differences *H_0: There is no first-order serial correlation in residuals* Arellano-Bond test for AR(2) in first differences *H_0: There is no second-order serial correlation in residuals*	z = -2.03 Pr > z = 0.042 z = 1.34 Pr > z = 0.180
Hansen test (Robust, but weakened by many instruments) *H_0: Instruments are valid instruments*	Chi2(21) = 21.19 Prob > Chi2 = 0.447

Table 9: First-stage regression of TE

TE	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ROE						
L1.	-0.01267	0.067433	-0.19	0.851	-0.14623	0.120887
GDPGR	0.01592	0.019387	0.82	0.413	-0.02248	0.054317
UNE	0.008385	0.067722	0.12	0.902	-0.12575	0.142517
LOSRES	-2.00188	1.589565	-1.26	0.21	-5.15022	1.146451
EQAS1	-0.47889	0.329268	-1.45	0.149	-1.13105	0.173268
COSI1	0.001574	0.000335	4.7	0.000	0.00091	0.002237
LODEP	-0.20199	0.06595	-3.06	0.003	-0.33261	-0.07137
lnSIZE	-0.01607	0.021443	-0.75	0.455	-0.05854	0.026405
EMP	-1.41E-06	2.33E-06	-0.6	0.547	-6.03E-06	3.21E-06
CR5	0.002717	0.001335	2.03	0.044	7.23E-05	0.005361
NIIA	6.472921	1.212489	5.34	0.000	4.071434	8.874409
MS2	0.456048	0.251782	1.81	0.073	-0.04264	0.954735
_cons	0.719438	0.536127	1.34	0.182	-0.34243	1.781305
Included instruments:	L.ROE GDPGR UNE LOSRES EQAS1 COSI1 LODEP lnSIZE EMP CR5 NIIA MS2					

According to the table 9, the two selected instruments, NIIA (net interest income over asset) and MS2 (market share), are significantly correlated with TE. The number of instruments (33) is smaller than the number of observations (129). Further, the F of the The Angrist-Pischke (AP) F test is 17.43, which is between the 10% (19.93) and 15% (11.59) maximal IV size of the Stock-Yogo critical values[3]. This means the bias in selected instruments in the model is only at 10%, hence endogenous regressor (i.e. TE) is strongly identified.

For the underidentification test, p-value is close to zero, which shows the null hypothesis that the studied equation is underidentified is rejected.

For the test of joint significance of endogenous regressors, p-values of the Anderson-Rubin test and the Stock-Wright S Statistics are both close zero. This means the coefficients of the endogenous regressors in the structural model are not jointly equal to zero.

[3] The table of Stock-Yogo critical values is in the table 12 in the appendix

For the endogeneity test, as p-value is close to zero, the null hypothesis that the TE can actually be treated as exogenous is rejected. Thus, TE can only be endogenous, thus the use of SGMM is appropriate.

The SGMM assumes that the twice-lagged residuals are not autocorrelated (Efendic et al., 2008, p. 12); hence there is a need to test for the first- and second-order autocorrelation in the error terms, which is also known as a test for the validity of instruments. According to results in the model diagnostics, the null hypothesis that there is no first-order serial correlation in residuals is rejected at 5% level of confidence, whereas the null hypothesis that there is no second-order serial correlation in residuals is not rejected at 10% level of confidence. This is consistent with the suggestion of Arrelano and Bond (1991).

Finally, as the prob > chi2 is 0.447, the Hansen test of overidentifying restrictions does not reject the null at any conventional level of significance, which indicates that the model has valid instrumentation. Further, the p-value of 0.447 is also in line with Roodman's suggestion that the p-value should be at least 0.25 higher than the conventional 0.05 or 0.10 levels to deal with the problem of too many instruments. As a result, SGMM results in this paper are reliable.

5.2.2 Descriptive results

Table 10: Descriptive statistics

Variable	Observations	Mean	Std.Dev	Min	Max
ROE	207	0.105967	0.095881	-0.82002	0.431383
GDPGR	207	6.106222	0.747267	5.247367	7.547248
UNE	207	2.171981	0.169773	1.9	2.4
LOSRES	204	0.013245	0.008567	0.001009	0.050586
EQAS1	207	0.121984	0.107791	0.009428	0.938882
COSI1	207	13.26841	28.20451	-22.0781	258.0836
LODEP	207	0.672814	0.403563	0.185195	5.057954
lnSIZE	207	17.61217	1.372917	14.38115	20.23705
EMP	149	5574.154	6217.886	324	41289
CR5	207	58.7272	12.57302	46.54	91.99
TE	207	0.70172	0.141377	0.338253	0.94717

Source: Author's calculation

The table 10 presents the descriptive statistics for the variables used in the regression of banks' profitability. On average, ROE of the Vietnamese banking system is about 10.5% in the last decade. The standard deviation of this figure is about 9% indicating a big difference in ROEs of banks in Vietnam. Particularly, the maximum ROE of 0.43.1 belongs to Agribank in 2006 when there was a boom in the Vietnamese securities market with an unbelievable rise in VNIndex of 146%. The minimum ROE of -0.82 belongs to Tien Phong Commercial Joint Stock Bank in 2011 which was almost forced to be merged due to being categorised as "weak bank" under the Restructuring Financial Institutions 2011-2015 programme. All of the bank-specific factors have large standard deviation showing wide disperse between the highest value and lowest value of these variables. This means in Vietnam the performance and operation among banks are rather different to each other in the last 10 years. The significant difference between the highest and lowest CR5 of 91.99% and 46.54% in 2004 and 2011 shows the success of JCBs in grabbing market share of SOCBs during the period of 2004-2013.

5.2.3 Discussion of banks' profitability result

The results of the SGMM are presented in the following table:

Table 11: Dynamic panel-data estimation, two-step system GMM

ROE	Coef.	Corrected Std. Err.	z	P>|z|	[95% Conf. Interval]	
ROE L1.	0.249931	0.237759	1.05	0.293	-0.21607	0.715931
GDPGR	-0.00453	0.008059	-0.56	0.574	-0.02033	0.011266
UNE	0.084885	0.036217	2.34	0.019	0.013901	0.15587
LOSRES	-0.75426	1.786937	-0.42	0.673	-4.25659	2.748075
EQAS1	-0.32588	0.551987	-0.59	0.555	-1.40776	0.755994
COSI1	-0.00282	0.001275	-2.21	0.027	-0.00531	-0.00032
LODEP	-0.13956	0.065931	-2.12	0.034	-0.26878	-0.01033
lnSIZE	0.007914	0.018316	0.43	0.666	-0.02798	0.043812
EMP	1.50E-06	2.38E-06	0.63	0.527	-3.16E-06	6.17E-06
CR5	-0.00026	0.001033	-0.25	0.799	-0.00229	0.001762
TE	0.098853	0.04293	2.3	0.021	0.014712	0.182995
_cons	-0.10809	0.465407	-0.23	0.816	-1.02027	0.804088
Excluded instruments: MS2 NIIA						

Overall, the unemployment rate (UNE) and technical efficiency (TE) are found to have positive impacts on ROE; while cost to income ratio (COSI1) and loan to deposit ratio (LODEP) are negatively correlated with ROE. GDP growth (GDPGR), impaired loan reserve to gross loan ratio (LOSRES), equity to total asset ratio (EQAS1), size (lnSIZE), number of employees (EMP) and concentration ratio (CR5) are not important in determining the profitability of banks in Vietnam in the studied period. Detailed discussion is as follows.

Bank-specific determinants

Operational management

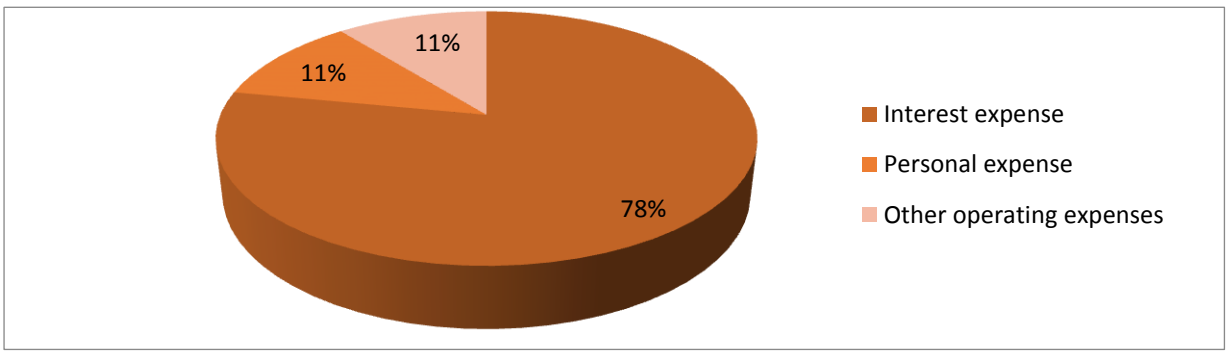
This paper found a positive relationship between TE and ROE, which means that when a bank increases TE, there will be a rise in ROE. This result is in line with Berger (1995) and as CR5 is insignificant, there is evidence for the existence of the efficiency structure hypothesis in the Vietnamese banking sector. As the efficiency analysis above shows that a typical bank in Vietnam wastes about 26.2% of its costs

relative to the best-practice banks, the finding of positive relationship between TE and ROE will encourage banks to improve their usage of inputs in producing outputs.

The result with respect to the impact of lnSIZE on profitability supports the findings of Micco et al. (2007) who found no correlation between the bank size and profitability. In other words, banks in Vietnam do not benefit from exploiting economy of scale by increasing size. In fact, given a wide national branch networks and support from the government, large banks in Vietnam especially SOCBs are not performing better than (if not worse than) FBs and medium JCBs in retail banking with limited branch networks (Quach, 2011). Thus, the result that bank size does not affect bank profitability in Vietnam is justifiable.

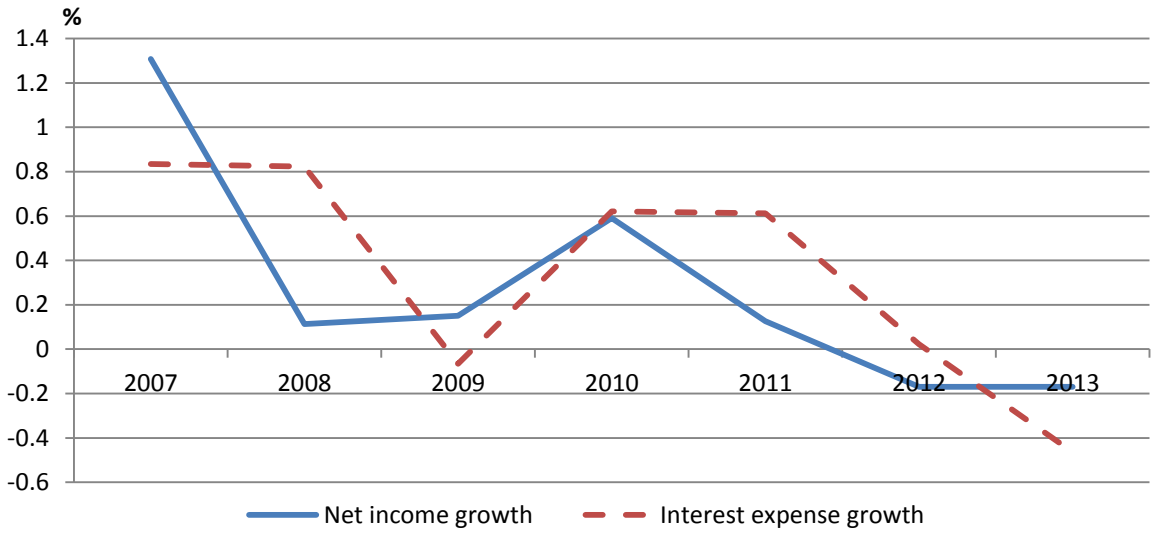
Unsurprisingly, COSI1 is negatively correlated with ROE, which means higher costs to net income will lead to lower profit. The poor expense management is considered the main contributor to poor profitability performance. This is consistent with the existing literature and many studies (Kosmidou, 2008, Liu and Wilson, 2009, and Goddard et al., 2001). With respect to expenses management in Vietnam, banks should focus on interest expense as it accounts for 78% of total expenses in the last decade (see figure 12). According to the figure 13, the interest expense management of the Vietnamese banking system was inefficient in 2008, 2011 and 2012, when net income growth was lower than interest expense growth. The situation was reversed in 2007, 2009 and 2013 showing that the interest expense management was better in these years.

Figure 12: Distribution of expenses for the Vietnamese banking system in the period 2004-2013



Source: Author's calculation

Figure 13: net income growth vs interest expense growth



Source: Author's calculation

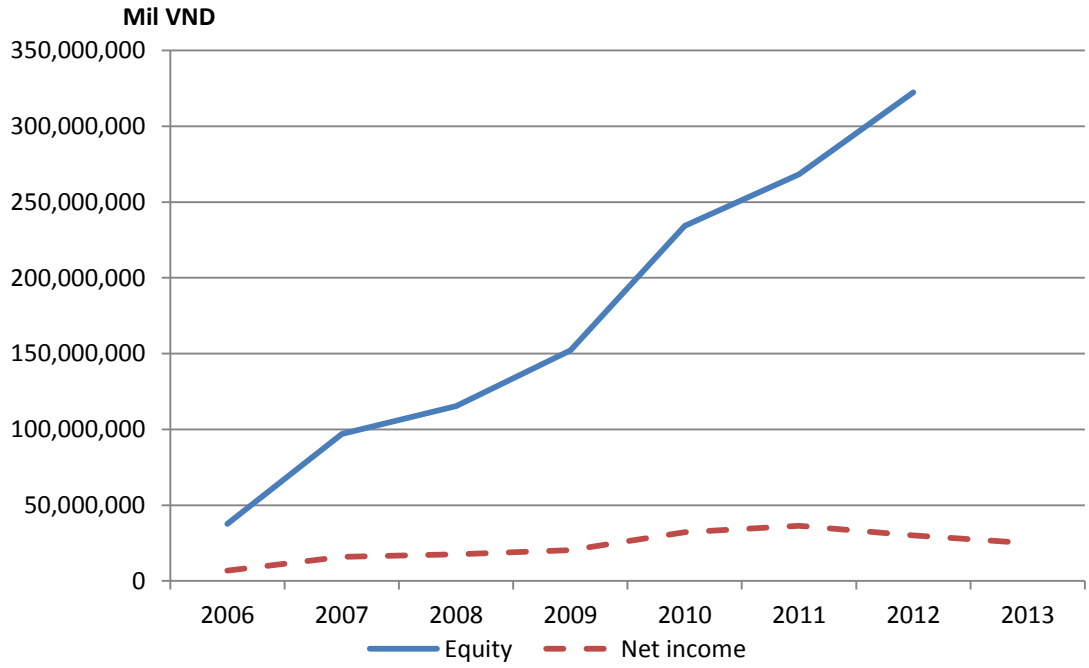
The number of employees (EMP) is found to have no effects on banks' profitability in Vietnam. This is in line with the findings of Aburime (2008) who found that staff number does not significantly determine the profitability of banks in Nigeria from 2000 to 2004. The period of 2004-2013 witnessed a significant change in banking technology in Vietnam consisting of the use of banking software to computerize transactions, the development of the ATM networks, the issuing of debit and credit cards, internet banking services (Vu and Turnell, 2010). Thus, in terms of human resources, quantity is no longer important and banks focus more on quality instead. In fact, some large banks in Vietnam reduced the number of employees recently. For example, in 2013, the number of employees in Maritime bank and ACB reduced by 1,343 and 1,115 respectively. This was because both banks want to reduce the scope of activities and concentrate on their own focuses to improve the quality of their products and services (Maritime bank annual report, 2013 and ACB annual report 2013).

Risk management

Empirical studies show a positive relationship between equity to asset ratio (EQAS1) and bank profitability (ROE). For instance, Pasiouras and Kosmidou (2007) and García-Herrero et al. (2009) explained banks with higher capital adequacy have less need to external funding and hence obtain more profit. Further, Kosmidou (2008)

argues that banks with high capital adequacy can access to cheap resources due to the lower risk of going bankrupt. Nevertheless, this relationship does not apply for the Vietnamese banking system in which EQAS1 is insignificant. This means in Vietnam the level of equity does not influence costs of funding. This can be explained by the structural framework of the Vietnamese banking system where many large banks rely on government funding through recurrent recapitalizations as stated in the country analysis section. Further, the figure 14 also shows that equity is not effective in determining bank profitability in Vietnam when equity increased significantly while net income just went up very slightly. The dramatic increase in equity of the Vietnamese banking system is due to the adoption of Basel I on capital adequacy in late 2005. Before 2005, the capital adequacy ratio of SOCBs in Vietnam just varied from about 3.5% to 5.5%, which was low compared to the requirement of at least 8% of Basel I (see table 15 in the appendix)

Figure 14: Equity vs Net income



Source: Author's calculation

Loan to deposit ratio (LODEP) is found to have a negative impact on ROE of banks in Vietnam. This is inconsistent with existing literature which says that higher LODEP will lead to lower liquidity resulting in higher profitability (or more loans, higher profit).

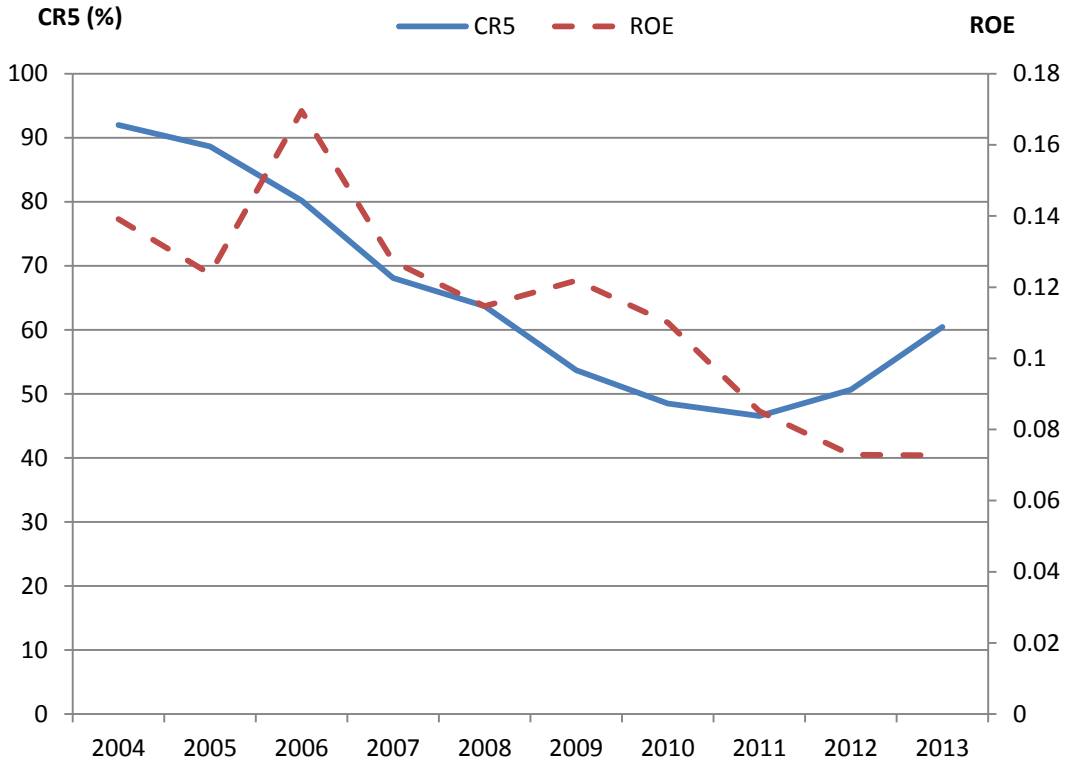
There are two reasons for this result. First, soft budget constraints created by recurrent recapitalizations in the last decade in Vietnam "encouraged" banks especially SOCBs to continue to make inefficient loans (Le, 2006). The situation became worse as soft budget constraints of banks will lead to soft budget constraints of borrowers (Berglof and Roland, 1997) and this resulted in the situation that banks only finance worst firms. Second, banks in Vietnam place greater value on political connections and partnership relationship than performance in giving loan, thus firms with greater access to bank loans are no more profitable than firms without them (Malesky and Taussig, 2009). Bui (2013) also revealed that some JCBs spent up to 60%-70% of their total loans to finance their partners and shareholders. As banks in Vietnam rely on government's support and connections to make loans regardless the creditability of borrowers, LODEP is negatively correlated with ROE.

Impair loan loss reserves to gross loan ratio (LOSRES) is found not to be important in determining banks' profitability in Vietnam in the period 2004-2013. This result is consistent with Dinh (2013) who found loan loss provision to total asset ratio is irrelevant with profit before tax when studying 51 commercial banks operating in Vietnam from 2000 to 2012.

Industry-specific and macroeconomic determinants

The result shows that the coefficient between the concentration ratio (CR5) and profitability is insignificant, which means there is no evidence for the existence of the SCP hypothesis in the Vietnamese banking system. Staikouras and Wood (2003) also reported the same result when they examined the performance of a sample of banks operating in thirteen EU banking markets. In other words, banks in Vietnam do not earn abnormal profit through getting concentrated. The figure 15 also illustrates that there is no specific relationship between CR5 and ROE for the Vietnamese banking system. The decrease in ROE is due to the negative effects of economic downturn; and the decrease in concentration ratio is due to tough competition between SOCBs and other non-state commercial banks. Specifically, there was a substantial reduction in the total loans of the sector made by SOCBs from 74.2% in 2005 to 48.3% in 2010. Their deposit market share also reduced from 74.2% to 47.7% during the same period.

Figure 15: CR5 vs ROE



Source: Author's calculation

GDP growth (GDPGR) is found to be insignificant, which means banks in Vietnam do not benefit from GDP growth. The result is consistent with Ongore and Kusa (2013) and Flamini et al., (2009). Theoretically, GDP growth can have positive impacts on banks' profitability as growth of personal consumption, investment, net exports of goods and services implies the increased demand for bank loans and thus bank profit. Nevertheless, the underdeveloped consumer banking in Vietnam diminishes the influence of GDP growth on banks' profitability. Even though the last decade witnessed a significant advance in banking technology such as the development of ATM system or the issuing of debit and credit cards, the number of people actually using them is limited. In 2009, Moody (2009) reported that only 17% of the population of Vietnam have bank accounts. In 2012, Williams (2012) reported that just 32% maintain a transactional account, 31% use debit cards, and only 12% use banks for deposit accounts. He also revealed that only 42% are aware of credit card services, 19% are even not knowledgeable how they work, and just 1% are using

them. Consequently, although Vietnam belongs to the minority group reporting a rise in GDP growth during the crisis period of 2009-2013, this does not affect the profitability of the banking system as expected.

Interestingly, the unemployment rate (UNE) has positive impacts on banks' profitability. Although this contrasts with existing literature arguing that banks can charge higher prices in the loan markets to earn higher returns in a good economic environment, this reflects the true picture of the Vietnamese banking system recent years. As already stated in the banking system analysis, Vietnamese banks are principally corporate lenders and two thirds of all enterprises primarily rely on bank loans for operations. Specifically, Vietnam Association of Consumer Goods Development (VACOD, 2012) reported that 90% of all seafood exporters 100% rely on bank loans or 70-90% of the total capitals of real estate enterprises are being financed by banks. It should be noted that banks in Vietnam finance many SOEs through buying government bonds (Bui, 2014). In order words, they lend the government and earn profits from government's budget. As there is no credit risk when banks make loans to the government, banks in Vietnam continue to finance SOEs to earn profits. Consequently, even when 100,000 enterprises out of 600,000 in total went bankrupt between 2011 and 2012, leading to the high unemployment rate during the economic crisis, banks still earned their own profit from the government's budget.

5.3 Policy discussion

This part suggests policies for bank managers, supervisors and regulators. The result of this paper suggest that bank manager should focus on the three important following elements as they have impacts on banks' profitability. First, a significant relationship between COSI1and ROE suggest that bank managers should pay attention to expense management, especially interest expense management as it accounts for 78% of total expenses. In 2013, banks are good at managing interest expense when the interest expense growth reduced by 0.46% for the whole system and was lower than net income growth. Bank managers should continue to improve interest expense management. Second, as LODEP is found to be negatively correlated with ROE, bank managers need to reconsider loan approval process. Banks should place greater value on performance of borrowers rather than on political connections and partnership relationship in giving loans, thus firms with greater access to bank loans need to be more profitable than firms without them. This is also a solution to reduce bad debts together with the establishment of VAMC of government to buy back bad debts in 2013. Third, as technical efficiency which reflects the effectiveness of banks in Vietnam to produce outputs given a set of inputs is found to be endogenous to ROE, it is affected by bank-specific factors consisting of poor risk management, inefficient screening and monitoring, or making loan decisions without anticipating changes in the business cycle rather than negative macroeconomic shocks or bad luck. Thus, the improvement of efficiency is under the control of bank managers. Further, a positive relationship between technical efficiency and ROE together with the irrelevance of concentration ratio (CR5) suggests the existence of efficiency structure hypothesis in the Vietnamese banking system. Consequently, so as to increase profitability, bank managers need to increase banks' efficiency. The average efficiency of 0.738 of the Vietnamese banking system in the last decade means that a typical bank wastes around 26.2% of its costs relative to the best-practice banks. In other words, on average, a bank needs to reduce 26.2% of its inputs in order to be as efficient as the best practice bank.

In respect to the banking industry, as concentration ratio (CR5) is not important in determining ROE in the Vietnamese banking system, there is no evidence for the

existence of the structure conduct performance hypothesis which argues that a higher bank concentration allows a higher degree of cooperation between banks and these banks might set higher prices and consequently gain substantial profits. This means banks' performance is not considered as a result of the exogenous structure of the market in Vietnam. In fact, the concentration ratio also reduced dramatically from 91.99% to 60.44% in the last decade due to tough competition from the entry of JCBs and FBs. For supervisors and regulators, this result suggests that banks in Vietnam do not exert a monopoly power entailing the exploitation of customers.

In terms of macroeconomic factors, the underdeveloped consumer banking in Vietnam diminishes the influence of GDP growth on banks' profitability. Even though the last decade witnessed a significant advance in banking technology such as the development of ATM system or the issuing of debit and credit cards, the number of people actually using them is limited. Banks should pay more attention to consumer banking to take more advantages from the growth in GDP. In addition, the result also shows that banks can still earn profit through investing in government bonds even when the economic condition is bad reflecting through an increase in unemployment rate. The paper suggests that the government should not continue to finance inefficient SOEs through banks' budget as this causes irrational allocation of the country's financial resources.

CHAPTER 6: CONCLUSIONS

This paper specified an empirical framework to estimate the technical efficiency level of Vietnamese banks and then investigate its effect and other bank-specific, industry-specific and macroeconomic determinants on the profitability of the banking system in Vietnam during the period 2004-2013. An unbalanced panel data of 43 banks with 207 observations is utilized.

With respect to technical efficiency, on average, the efficiency level is around 73.8%. Furthermore, the period also witnessed a decreasing trend with the gap of efficiency between banks widening throughout the period. This is consistent with many studies about the efficiency level of the Vietnamese banking system (see Vu and Turnell, 2010; Ngo, 2012 and Nguyen and DeBorger, 2008). There are three major drops in the efficiency level of the Vietnamese banking system in 2007, 2009 and 2013. The first one is likely due to the "bubble and trouble" of the Vietnamese security market started in 2006 when Vietnam joined WTO. The 2009 drop can be primarily attributed to the instability of the Vietnam's economy caused by the global financial crisis. Multiple scandals, specifically illegal cross-bank deposits and investment of the banking tycoon Nguyen Duc Kien, the bad debt concealment of commercial banks and the inefficient "loan growth restriction" programme, led to a reduction of efficiency in 2012 and 2013. In addition, larger banks seem not to outperform smaller banks in technical efficiency which is consistent with results of Berger and Mester (1997). The most efficient banks in Vietnam are middle-sized banks.

In terms of determinants of bank profitability, bank-specific (including technical efficiency), industry-specific and macroeconomic factors are considered. For bank-specific variables, the cost-to-income (COSI1) has a negative and significant impact on profitability, which shows that cost decisions of bank management are instrumental in influencing bank performance. Additionally, the loan-to-deposit (LODEP) ratios are also negatively related to the profitability of Vietnamese banks, which questions the quality of loans of the system when banks place greater value on connections than performance in giving loans. Technical efficiency (TE) is found to be positively correlated with Vietnamese bank profitability, which shows the existence of efficient structure hypothesis in which increased efficiency can lead to higher profit. Further, as TE is found to be endogenous to ROE, which means TE is

influenced by internal factors inside banks, there is opportunity for bank managers to improve bank efficiency. The estimated effect of size (LnSIZE) does not provide evidence of economies of scale in the system. Likewise, the improvement in banking technology during the last decade diminishes the effects of the number of employees (EMP) on bank performance, and banks instead focus more on quality of employees. The insignificance of the equity-to-asset ratio (EQAS1) means that in Vietnam the level of equity does not influence costs of funding and thus has no impacts on profitability. Besides, the impair loan loss reserves to gross loan ratio (LOSRES) also has no impacts on bank performance, which is in line with Dinh's result (2013).

For macroeconomic factors, the positive relationship between unemployment rate and bank performance reveals the irrational use of government bonds of the government to finance inefficient SOEs through bank's budget. The finding of Malesky and Taussig (2009) supports this result. Moreover, GDP growth is insignificant in explaining bank profitability. One of the main reasons for this result is that the underdeveloped consumer banking in Vietnam diminishes the influence of GDP growth on banks' profitability as banks cannot take advantage of the personal consumption growth when the number of people actually using consumer banking is limited. For industry variables, it is noteworthy that the concentration ratio (CR5) is not important in explaining bank profitability. This shows that banks in Vietnam do not exert a monopoly power which entails the exploitation of customers.

Overall, these empirical results provide evidence that the profitability of Vietnamese banks is shaped by bank-specific factors (including TE) and macroeconomic control variables. Industry structure does not seem to significantly affect profitability. Further, TE is found to be endogenous to ROE, which means it is affected by bank-level management rather than bad luck. The approach followed in this research can have considerable potential as a tool for exploring bank efficiency level and profitability determinants with the aim of suggesting optimal policies to bank management.

Although efforts have been made to ensure that the estimated results are reliable such as removing investment banks or using GDP deflator to combat inflation before estimation, missing data prevent the desire to produce a plausible estimation. As Vietnam has just started to be integrated into the world economy since 2006, the availability of published accounts is limited. After handling for missing data, the

sample size reduces from 610 to 207 observations. Further, this paper only examines technical efficiency under SFA method and the impact of selected determinants on ROE. Hence, this research can be extended by investigating cost efficiency and profit efficiency, using non-parametric approaches such as DEA and selecting other determinants and other profitability measures such as return on asset, profit before tax or net income.

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APPENDIX

Table 12: Stock-Yogo critical values for the weak instrument test (Significance level is 5%)

No of instruments	n = 1, r =				n = 2, r =			
	0.10	0.15	0.20	0.25	0.10	0.15	0.20	0.25
1	16.38	8.96	6.66	5.53				
2	19.93	11.59	8.75	7.25	7.03	4.58	3.95	3.63
3	22.3	12.83	9.54	7.8	13.43	8.18	6.4	5.45
4	24.58	13.96	10.26	8.31	16.87	9.93	7.54	6.28
5	26.87	15.09	10.98	8.84	19.45	11.22	8.38	6.89
6	29.18	16.23	11.72	9.38	21.68	12.33	9.1	7.42
7	31.5	17.38	12.48	9.93	23.72	13.34	9.77	7.91
8	33.84	18.54	13.24	10.5	25.64	14.31	10.41	8.39
9	36.19	19.71	14.01	11.07	27.51	15.24	11.03	8.85
10	38.54	20.88	14.78	11.65	29.32	16.16	11.65	9.31
11	40.9	22.06	15.56	12.23	31.11	17.06	12.25	9.77
12	43.27	23.24	16.35	12.82	32.88	17.95	12.86	10.22
13	45.64	24.42	17.14	13.41	34.62	18.84	13.45	10.68
14	48.01	25.61	17.93	14	36.36	19.72	14.05	11.13
15	50.39	26.8	18.72	14.6	38.08	20.6	14.65	11.58
16	52.77	27.99	19.51	15.19	39.8	21.48	15.24	12.03
17	55.15	29.19	20.31	15.79	41.51	22.35	15.83	12.49
18	57.53	30.38	21.1	16.39	43.22	23.22	16.42	12.94
19	59.92	31.58	21.9	16.99	44.92	24.09	17.02	13.39
20	62.3	32.77	22.7	17.6	46.62	24.96	17.61	13.84
21	64.69	33.97	23.5	18.2	48.31	25.82	18.2	14.29
22	67.07	35.17	24.3	18.8	50.01	26.69	18.79	14.74
23	69.46	36.37	25.1	19.41	51.7	27.56	19.38	15.19
24	71.85	37.57	25.9	20.01	53.39	28.42	19.97	15.64
25	74.24	38.77	26.71	20.61	55.07	29.29	20.56	16.1
26	76.62	39.97	27.51	21.22	56.76	30.15	21.15	16.55
27	79.01	41.17	28.31	21.83	58.45	31.02	21.74	17
28	81.4	42.37	29.12	22.43	60.13	31.88	22.33	17.45
29	83.79	43.57	29.92	23.04	61.82	32.74	22.92	17.9
30	86.17	44.78	30.72	23.65	63.51	33.61	23.51	18.35

Source: Stock-Yogo (2005)

Table 13: list of banks in the studied sample

Bank name	Type		
Bank for Investment and Development of Vietnam – BIDV	SOCB	Saigon - Hanoi Commercial Joint Stock Bank	JCB
Housing Bank of Mekong Delta – MHB	SOCB	Saigon Bank for Industry and Trade	JCB
Joint Stock Commercial Bank for Foreign Trade of Vietnam – Vietcombank	SOCB	Saigon Commercial Bank – Saigonbank	JCB
Vietnam Bank for Agriculture and Rural Development – Agribank	SOCB	Saigon ThuongTin Commercial Joint-Stock Bank – Sacombank	JCB
Vietnam Joint-Stock Commercial Bank for Industry and Trade – Viettinbank	SOCB	Southeast Asia Commercial Joint Stock Bank-SEA Bank	JCB
VID Public Bank	JVB	Southern Bank-Phuong Nam Commercial Joint Stock Bank	JCB
Vietnam-Russia Joint Venture Bank	JVB	Southern Commercial Joint Stock Bank	JCB
An Binh Commercial Joint Stock Bank – ABBANK	JCB	Tien Phong Commercial Joint Stock Bank	JCB
Asia Commercial Joint-stock Bank – ACB	JCB	Viet Capital Commercial Joint Stock Bank	JCB
Bao Viet Commercial Joint Stock Bank	JCB	Viet Nam Thuong tín Joint Stock Commercial Bank – VietBANK	JCB
DongA Commercial Joint Stock Bank	JCB	Vietnam Asia Commercial Joint-Stock Bank	JCB
Global Petro Commercial Joint Stock Bank	JCB	Vietnam Development Bank - VDB	JCB
Ho Chi Minh City Development Joint Stock Commercial Bank	JCB	Vietnam Export Import Commercial Joint Stock Bank	JCB
Lien Viet Post Joint Stock Commercial Bank	JCB	VietNam International Commercial Joint Stock Bank – VIB	JCB
Mekong Development Joint Stock Commercial Bank	JCB	Vietnam Maritime Commercial Stock Bank	JCB
Military Commercial Joint Stock Bank	JCB	Vietnam Prosperity Joint Stock Commercial Bank – VP Bank	JCB
Nam A Commercial Joint Stock Bank	JCB	Vietnam Technological and Commercial Joint-Stock Bank – Techcombank	JCB
Nam Viet Commercial Joint Stock Bank – Navibank	JCB	ANZ Bank (Vietnam) Limited	FB
Ngan hang Thuong mai Co Phan Bac A – BAC A Bank	JCB	Hong Leong Bank Vietnam Limited	FB
North Asia Bank	JCB	Shinhan Bank Vietnam	FB
Ocean Commercial Joint Stock Bank	JCB		
Orient Commercial Joint Stock Bank	JCB		
Petrolimex Group Commercial Joint Stock Bank – PG Bank	JCB		

Table 14: Structure of Vietnam's banking system 1990-2013

	1990	1991	1993	1995	1997	1999	2001	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
SOCBs	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
JCBs	0	4	41	48	51	48	39	37	36	37	34	34	39	40	37	35	38	38
JVBs	0	1	3	4	4	4	4	4	4	5	5	5	5	5	5	4	4	4
FBs	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5	5	5	8
Total	4	9	48	56	60	57	48	46	45	47	44	44	54	55	52	49	52	55

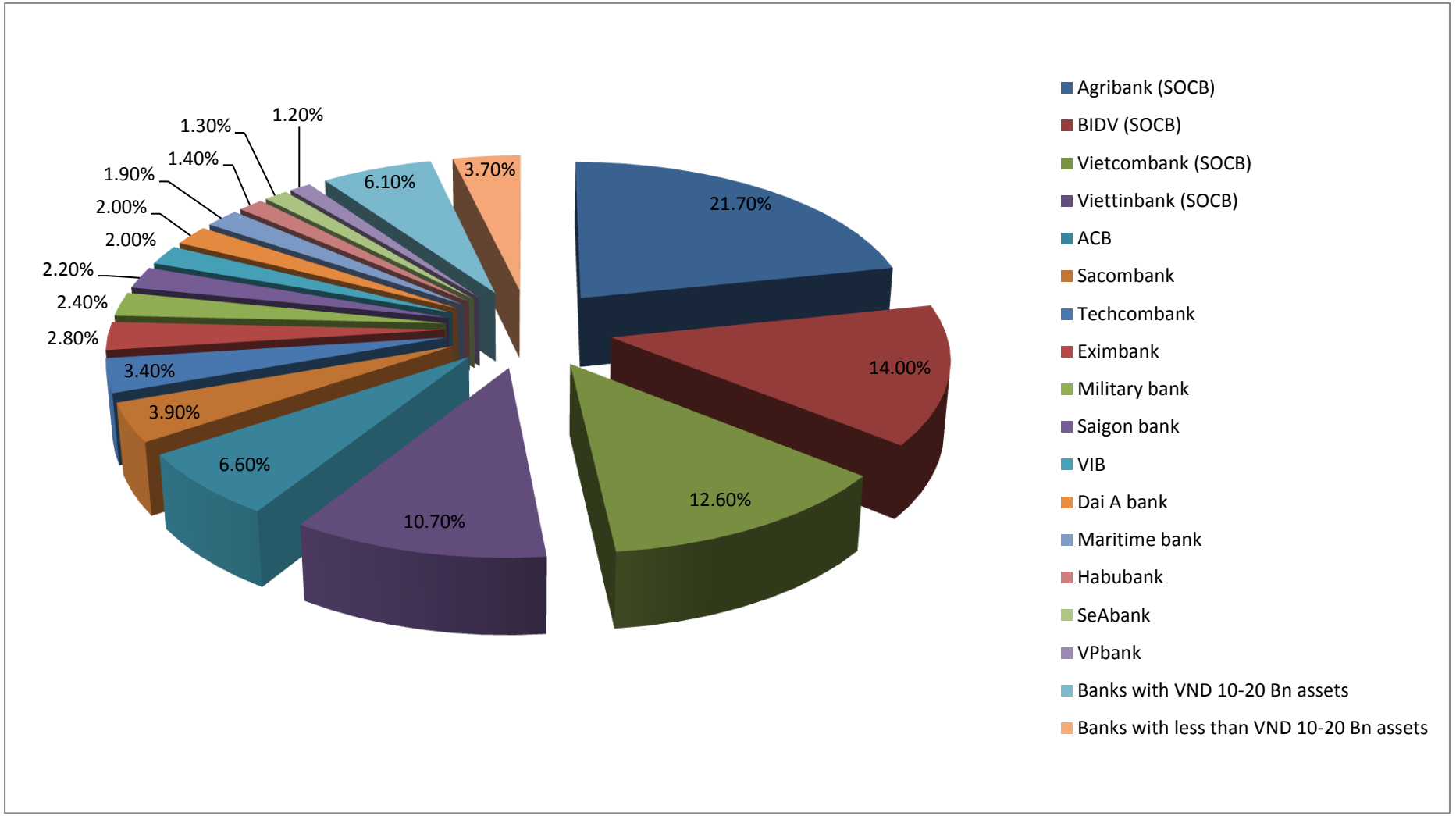
Source: Lieu and Vo (2012), Le (2006) and SBV annual report 2011, 2012, 2013

Table 15: Capital adequacy ratio of SOCBs in Vietnam before 2005

	1998	1999	2000	2001	2002	2003	2004
Agribank	5.63%	5.54%	4.70%	3.09%	4.75%	4.30%	5.43%
BIDV	2.35%	2.58%	2.60%	1.74%	3.00%	3.50%	4.76%
Viettinbank	2.08%	2.42%	2.33%	1.47%	3.38%	3.40%	3.64%
Vietcombank	2.07%	2.18%	1.79%	1.39%	3.08%	3.5%	3.64%

Source: Le (2006)

Figure 16: Market share of banks in Vietnam



Source: Moody (2009)